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On Some Correlations between Grammar and Brain Lateralization

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Abstract and Keywords

While the study of language has been approached from a wide range of perspectives and theoretical assumptions, it is widely assumed that language structure can be reduced essentially to a fairly monolithic system of mental and linguistic activity. Some recent lines of psychological, linguistic, and neurolinguistic research suggest, however, that human cognitive behavior in general and linguistic discourse in particular exhibit a dualistic organization. In accordance with this research tradition, the present paper argues that there is a basic distinction between two domains of linguistic discourse and that this distinction shows a number of correlations with neural processing, more specifically with hemispheric lateralization of the human brain.

Keywords: Discourse grammar, lesion studies, priming, right hemisphere, human brain, situation of discourse, social context, speaker context, speaker-hearer interaction, text organization, thetical

1. Introduction

Some lines of recent research suggest that human cognitive behavior in general and linguistic discourse in particular cannot reasonably be reduced to one monolithic system of mental processing. This hypothesis is not new, it has been proposed by a number of authors using a variety of different approaches and following different directions of research. It surfaces in particular in psychological work on brain activity (Kahneman 2012), in psycholinguistic research on text comprehension (Kintsch 1988; Gernsbacher 1990; Graesser et al. 1994; Greene et al. 1992; McKoon and Ratcliff 1990, 1992, 1998; Prat et al. 2007), in neurolinguistic research on linguistic processing (Van Lancker Sidtis 2009), in linguistic work on performance (Clark 1996; Clark and Fox Tree 2002), on speech act formulas (Pawley 2009), on discourse organization (Kaltenböck et al. 2011; Heine et al. 2013), on the analysis of conversations (Haselow 2011, 2013), and on bilingualism (Maschler 1994).

While the methodological and factual basis underlying these works differs greatly from one another, all this research seems to converge on the following: First, mental processing appears to exhibit a dualistic organization and, second, this organization is immediately reflected in the structure of linguistic discourse, that is, the way languages are used.

In accordance with this research tradition, the present paper argues that there are a number of principal correlations between linguistic structure and neural processing (see also Heine et al. 2014). To this end, section 2 will provide an overview of linguistic functions that have been hypothesized to implicate the right brain hemisphere as being at least to some extent involved in processing speech phenomena. Linguistic analysis will be based on the framework of Discourse Grammar, a sketch of which is provided in section 3.1, but our interest will be exclusively with Thetical Grammar, that is, one of the two domains of Discourse Grammar. In section 3.2 we will propose to relate observations on neural and linguistic processing to one another, and some conclusions are drawn in the final section 4.

2. Salient Linguistic Contributions of the Right Hemisphere

That the two hemispheres of the human brain perform different functions is an old assumption in neuroscience, going back to the nineteenth century. One of these differences concerns speech, or language processing. While both hemispheres are needed in normal communicative settings, it seems to be fairly uncontroversial that the left hemisphere (LH) is language-dominant, playing an essential role in processing speech phenomena, not only with spoken but also with signed sentence input (e.g., Sakai et al. 2005). The primary role of the LH as the locus of processing of most language tasks has been well described; in fact, this constitutes one of the best-established generalizations about the human brain (Jung-Beeman 2005). "Speech functions" are lateralized in the LH in most adults regardless of hand preference (Branch et al. 1964; Witelson and Pallie 1973). A study of 188 right-handed subjects by Knecht et al. (2000), using a functional imaging technique, showed that it is altogether 92.5% of the subjects that turned out to have LH language dominance while only 7.5% had right hemisphere (RH) language dominance.¹ The questions that we are concerned with here are:

(1)

- a. Does the neuroanatomy of the right hemisphere of the human brain contribute to linguistic processing?
- b. If yes, what is the nature of this contribution?

It would seem that question (1a) can be answered in the affirmative. While there seems to be a strong bias in favor of the left perisylvian cortex (Hagoort and Poeppel 2013: 248), there is a wide range of data, based on different kinds of approaches, suggesting that linguistic processing is not entirely restricted to the left hemisphere. For example, Neiningner and Pulvermüller (2003) found that patients with lesions in the right frontal lobe showed most severe deficits in processing action verbs, whereas those with lesions in their right temporo-occipital areas showed most severe deficits in processing visually related nouns. Deficits of this kind, which were absent in the control group of the experiment, suggest, first, that the RH not only contributes to but also plays a specific role in word processing and, second, that it appears to be implicated differentially in features of linguistic categorization (cf. also Van Lancker 1997; Tompkins et al. 2002 for overviews).

The focus of attention in the remainder of the paper is on question (1b). Discussion is restricted to some major themes and findings that have, or can be suspected to have, a bearing on answering this question. Our concern is not with the alternative between LH and RH, that is, with whether a given linguistic stimulus is associated either with LH or RH activity. What we wish to look into, rather, is simply whether there is evidence to establish that the RH is involved at least to some extent, irrespective of what the contribution of the LH may be.

The survey data presented in this section rely most of all on lesion studies of persons suffering right hemisphere damage (RHD) or left hemisphere damage (LHD), on brain-imaging studies,² and on neuropsychological studies, but are not restricted to such works. There exists by now a vast amount of neurolinguistic data on this general issue, and the present survey can by no means do justice to the field; rather, it is based on data that were immediately accessible to us and no claim is made that the data presented and the functions identified are representative of all the findings that have been made in this dynamic field of research.

2.1 Relating Semantically Distant Concepts to One Another

One major theme of hemisphere-related research concerns the processing of meaning. It has been argued in some form or other that closely related meanings of linguistic expressions are likely to implicate the LH whereas distantly related meanings are more likely to involve RH activity (cf. Hagoort et al. 1996).

Such observations have been made in a wide range of neurolinguistic studies. According to Beeman (1998), words are associated each with a smaller, more focused semantic field in the LH but with a large and diffuse semantic field in the RH. The LH is involved in rapid interpretation and establishing tight links in natural language comprehension, as opposed to the maintenance of broader meaning activation and recognition of distant semantic relations, which involves the right hemisphere (Jung-Beeman 2005: 517; Sherratt and Bryan 2012: 233; Chiarello 1998).

Research on semantic priming suggests that the LH selects closely related meanings and one single interpretation for each word. The right hemisphere, by contrast, maintains activation of distant semantic relations between words, multiple meanings of ambiguous words, and metaphoric interpretations (see Jung-Beeman 2005: 517). Furthermore,

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the RH is claimed to have available a broader range of word meanings than the LH (Beeman and Chiarello 1998: 4–5). Blonder et al. (1991: 1324) suggest that activation in the LH is restricted to the target and its most closely linked associates whereas in the RH many concepts give rise to weak activation for some time. Note also that for the LH, normal sentences are more effective primes than the same words presented in scrambled order, whereas semantic priming for the RH is not altered by scrambled word order.

The evidence from semantic priming studies of more widespread semantic network activation in the RH than in the LH has received support from some functional imaging studies which report more RH activation during the processing of obliquely related concepts, i.e., when reading semantically illogical words or verb-noun phrases are involved (Taylor and Regard 2003).

As this research suggests, the RH maintains facilitation for more distantly related words (e.g., *arm* vs. *nose*) and between a more frequently and a less frequently used homonym of a word (e.g., *bank* (financ.) vs. *bank* (of river)). On the other hand, direct priming from one prime word strongly related to the target word (e.g., *scissors* vs. *cut*) is more robustly located in the LH. And when analyzing lexical-semantic processing impairments in aphasic patients with LH lesions and non-aphasic patients with RH lesions, Hagoort et al. (1996) found that the latter tended to show a relatively focal impairment in the semantic matching of more distantly related words.

RH brain-damaged patients appear to have subtle semantic difficulties: they produced obscure responses on word-association tasks, displayed deficits in categorizing pictures of familiar objects into their respective categories, and lacked the normal tendency to cluster items according to a superordinate category when recalling items from memory tasks (Taylor and Regard 2003: 257).

Drawing on divided visual field priming with neurologically intact individuals, where the visual cortex in the LH or the RH is selectively stimulated, the processing of literal meaning suggests that both hemispheres show evidence of semantic priming with words that are associatively and semantically related (e.g., *doctor—nurse*), but the RH shows an advantage over the LH in the priming of words that have weak or indirect semantic relations (e.g., *dull—moody*, or *lawyer—nurse*) (Burgess and Simpson 1988; Chiarello et al. 1990; Chiarello 1991).

Other studies show that contextually irrelevant meanings of ambiguous words are primed in the RH but not in the LH (Arambel and Chiarello 2006). Some evidence suggests that there is an imbalance between activation and suppression processes between the two hemispheres of the following kind: Semantic access within the LH initially results in the activation of all meanings (e.g., of an ambiguous word). However, the contextually appropriate meaning is rapidly selected by the LH and integrated into the current discourse model and other plausible candidates are actively suppressed or deactivated. In the RH, by contrast, there is also an initial activation of multiple word meanings, but all these meanings are maintained for some indefinite period and then may decay, rather than being actively inhibited (Chiarello 1991; Faust and Chiarello 1998). Accordingly, Chiarello (1991) submits that semantic selection and integration processes do not occur in the RH because it lacks the mechanisms needed to build the one semantic representation that best fits the current context.

Such observations may be related to findings that have been made on the association of inferencing with RH activity. Some authors point out that right hemisphere damage (RHD) individuals may lack the “mental flexibility” for making inferences (Brownell et al. 1986) or accessing indirect speech acts (Champagne-Lavau and Joannette 2009). Right hemisphere brain-damaged patients were found to have difficulties following indirect commands, drawing inferences, and understanding jokes (Taylor and Regard 2003: 257; Blake 2009a, 2009b). According to the Coarse Coding Hypothesis of Beeman (1998), semantic representations in the RH exhibit an overlap of some semantic fields, allowing for an association to emerge between distantly related concepts inferentially connected to one another. Ability of the RH to access and interpret multiple meanings of ambiguous words has been linked to the inferring of the figurative meaning of nonliteral language. Based on a positron emission tomography (PET) study, Bottini et al. (1994) suspect that the behavior of the RH may reflect a special cognitive process of accessing world knowledge and drawing inferences from the context in order to resolve the ambiguity of the sentence.

Relative semantic distance and inferencing have also been said to be involved in the nonliteral use of linguistic expressions like metaphors and other figurative forms of speech (Bottini et al. 1994; Anaki et al. 1998), or indirect speech acts. Such forms of speech, where there is a contrast between a literal, or basic, or default meaning and a nonliteral, or transferred meaning, are claimed to be associated with differential hemispheric activity. For example, patients with RHD have been argued to rely primarily on literal meanings and neglect metaphorical relationships

(Winner and Gardner 1977; Rinaldi et al. 2004).

The exact role played by the RH in processing metaphors and other kinds of figurative language is still largely unclear; problems with the metaphor hypothesis are discussed in detail by Kasparian (2013). One of the problems concerns the question of whether metaphor, or figurative language in general, is suggestive of distant semantic relationship between the literal and the transferred meaning. This problem has to do with the modality of testing and the way semantic relationship is interpreted by speakers, hearers, or test persons (Giora et al. 2000; Gagnon et al. 2003; Kasparian 2013). What is perceived as semantically similar or distant is contingent in particular on whether the metaphor concerned is frozen or novel, whether the test person is or is not familiar with it, and/or what the context is in which the metaphor is produced. In addition, morphosyntactic considerations may also play a role, namely the extent to which the metaphor (or the idiom) is “prefabricated,” that is, componentially fixed and invariable (see section 2.34). Similar problems might obtain in the analysis of other kinds of “indirect” semantic relationship (Taylor and Regard 2003: 257; Blake 2009a, 2009b). Kasparian (2013) argues that rather than figurative speech it may be nonsalient and/or unfamiliar meanings of strings that are preferentially processed in the RH compared to the LH.

A related problem concerns possible context-induced differences between the two hemispheres in the way meanings are activated or suppressed; we have alluded to this problem earlier in this section. For example, Kacirik and Chiarello (2003) argue that the LH may have sentence constraints to select and integrate only contextually relevant literal and metaphoric meanings, whereas the RH may be less sensitive to sentence context, therefore being able to maintain the activation of alternative interpretations.

2.2 Pragmatic Anchoring of Discourse

Another general theme surfacing in neurolinguistic work concerns the role played by the pragmatics of linguistic communication. As argued in a number of studies, linguistic pragmatics, that is, the way meaning relates to the context in which it is used, implicates mainly the right, rather than the LH of the human brain.

LHD patients typically exhibit primary impairment in comprehending and appropriately using syntactic and semantic aspects of language; persons with RHD, by contrast, demonstrate great difficulty with pragmatic communication (Joanette et al. 1990; Molloy et al. 1990; Moscovitch 1983; Weylman, Brownell, Roman, and Gardner 1989; Ozonoff and Miller 1996; Cutica, Bucciarelli, and Bara 2006). RH lesion patients were found to ignore context and were not able to fill in what was not present in the words (Myers 1978). And such patients have difficulty utilizing and responding to all the extralinguistic or pragmatic aspects of communication (Shields 1991: 386). Van Lancker Sidtis (2009: 451–452) found that one of the patients who had sustained a large RH lesion was characterized by conversational speech that was often pragmatically inappropriate, even though his language abilities were intact.

A survey of neurolinguistic work suggests that participation of the RH in linguistic discourse can be divided into three main kinds of context, namely (a) the discourse context (also called the co-text), (b) the social context, and (c) the speaker context. We will now look at each of these kinds of context in turn.

2.2.1 Discourse Context

A theme frequently addressed in neurolinguistic work concerns the way in which mental models of discourse are built, and some of this work suggests that the two hemispheres are each associated with a different level of text planning. Right hemisphere engagement has been argued to occur routinely as readers attempt to construct a unitary coherent model of a discourse (St George et al. 1999: 1317, 1323). Accordingly, while RHD (right-hemisphere damage) subjects were found to produce narratives endowed with adequate microlinguistic structure, they produced significantly more violations of global coherence (Marini et al. 2005: 52; Marini 2012: 73).

Structuring clauses and sentences appears to be the domain of the LH; persons with RHD are considered to have little or no impairment of syntactic skills, and this appears to apply to the syntax of both simple and embedded clauses (e.g., of narratives or conversations) (Marini et al. 2005; Brady et al. 2006; Sherratt and Bryan 2012: 217).

The RH, by contrast, tends to be implicated when the processing of higher level information is involved (e.g., the integration of parts into a coherent whole) (Robertson et al. 2000), and the building of what tends to be referred to

as the “macrostructure” of discourse (see Sherratt and Bryan 2012: 215–216), for instance organizing and ordering discourse structure (Lojek-Osiejuk 1996). RHD following a stroke has been shown to lead to disturbances in communication skills, and these disturbances include difficulty in preserving the macro-structure and organization of discourse (Joanette et al. 1989; Hough 1990). Following RHD, therefore, “discourse” is claimed to be the major domain of communication deficits (e.g., Myers 2001; Lehman Blake 2006; Johns et al. 2008; Mackenzie and Brady 2008; Sherratt and Bryan 2012).

The RH has been argued to be relatively more involved in computing (nonlinguistic) situation models that, in speaking, provide the input to specifying the propositional content of an utterance (see Menenti et al. 2012 for discussion), and Marini et al. (2005: 53) speculate that the RH plays a relevant role in complex linguistic skills such as organizing a mental model for producing narratives. As noted by Tompkins et al. (2002: 436), RHD is associated with problems in “building, extracting, or applying the mental structures that guide discourse processing,” which is particularly noticeable in tasks that require linking multiple or disparate text elements, speaker knowledge, and situational context.

Presenting ten healthy, native English-speaking volunteers with written texts which consisted, on the one hand, of titled and, on the other hand, of untitled paragraphs, St George et al. (1999: 1317, 1323) conclude that RH engagement occurs routinely as readers attempt to construct a unitary coherent model of a discourse and to discover the producer’s intents. And it is especially the right middle temporal regions that appear to be important for integrative processes needed to achieve global coherence during discourse processing, where “integration” means that multiple pieces of information are integrated across sentences.

Such observations on discourse management can be related to findings on “relevance” made independently in a number of studies (e.g., Bloom et al. 1993; Lehman Blake 2005; Lojek-Osiejuk 1996). The RH tends to be activated to establish cohesive ties in narratives (Bloom 1994; Marini et al. 2005). According to these studies, the discourse of persons with right brain damage (RHD) exhibits lower rates of “relevance” rating than that of persons with no brain damage (NBD), where “non-relevance” concerns “extraneous or unnecessary” details in discourse (Lehman Blake 2005, 2006; Mackenzie et al. 1997; Marini et al. 2005), for example, use of additional and excessive detail, insufficient content, or information that is broadly related but not specifically appropriate (Sherratt and Bryan 2012).

The content of discourse produced by RHD individuals tends to be incoherent, tangential, and self-oriented (Blake 2006). Comparing a group of seven participants with RHD to a group of twelve non-brain damage (NBD) participants on a set of discourse tasks, Sherratt and Bryan (2012) found that the participants with RHD demonstrated statistically significant differences in syntactic complexity, “clarity disruptors,” and “disfluencies.” For example, on all discourse topics distinguished, participants with RHD produced more disfluencies (e.g., false starts, repetition, non-word fillers, part-word productions) than the NBD group. Furthermore, the participants with RHD showed, for example, an increased incidence of attempted cohesive ties, and they were less fluent. And their ratings for “relevance” were generally lower than those of the NBD group.

Being implicated in the “macro-structure” of discourse, the RH is said to be also dominant in the processing of paralinguistic information (Beeman and Chiarello 1998; Devinsky 2000). Some RHD patients have been found to have difficulty utilizing and responding to all the extralinguistic or pragmatic aspects of communication (Shields 1991: 386). RHD adults exhibit difficulties to govern verbal exchange since they take little account of their communicative partner (see 2.2.2 below). Accordingly, they have problems with paralinguistic means of speaker-hearer interaction such as sending or receiving information via facial expression (Blonder et al. 1991), establishing and maintaining eye contact (Myers 1994; Tompkins 1995), or spontaneously using gesture (Tompkins 1995). Note that many patients with acquired RHD demonstrate paralinguistic deficits, including impairments in prosody and gesture (Joanette et al. 1990).

2.2.2 Social Context

The right cerebral hemisphere seems to be clearly dominant in the mediation and control over most aspects of social functioning. As Joseph (2000) suggests, inappropriate social and emotional behaviors are predominantly associated with right frontal dysfunction. People with right brain damage (RHD) are considered to be socially disconnected from the world around them (Myers 1999). As a result, they show particular deficits in “the context-appropriate social use of language” (Tompkins et al. 2002: 435). Interpersonal, as well as emotional difficulties are among the main deficits experienced by patients who have suffered damage of the RH early in life or by

inheritance (Shields 1991). The RH has been portrayed as providing the social context of linguistic communication (Berman et al. 2003) and serving successful social communication (Mitchell and Crow 2005). And a number of studies suggest a predilection for RH processing of social and real-world contextual associations for lexical items (Drews 1987; Chiarello 1995; see also Van Lancker 1997, 2004). As pointed out in one study, between 50% and 78% of individuals with RHD may exhibit difficulties in one or more communication components, leading to inadequate social interactions (Ferré et al. 2011).

Social context concerns, on the one hand, the manner of interaction between speaker and hearer. People with RHD have been found to have difficulties sharing the responsibility to develop and maintain adequately the exchange with the speaker (Hird and Kirsner 2003), and they have an impaired appreciation of the hearer's needs (Myers 1994: 520). In particular, such people exhibit difficulties in governing verbal exchange since they take little account of their communicative partner. And persons with RHD following stroke have been found to exhibit impaired turn-taking and appreciation of the listener's perspective (Kaplan et al. 1990; Chantraine et al. 1998; Myers 1994), possibly including an impaired "theory of mind" (Siegal et al. 1996; Happe et al. 1999; Griffin et al. 2006), even if the evidence for the latter is not entirely conclusive (Lehman Blake 2010; Tompkins 2008, 2012; Sherrat and Bryan 2012: 218–219).

On the other hand, social context concerns also the nature of linguistic discourse. Languages dispose of specific constructions and expressions dedicated to maintaining or establishing social relations. One may therefore hypothesize that use of such constructions and expressions implicates the right rather than the left hemisphere. There is in fact evidence in support of this hypothesis.

Such evidence relates in particular to formulae of social exchange and vocative expressions. For example, one of the patients analyzed by Van Lancker Sidtis (2009: 451–452) having suffered right-sided subcortical damage showed deficits in her command of information units concerning speaker-hearer interaction, e.g. having difficulties with formulae of social exchange, such as greetings and leave takings. Similar observations were made with vocatives, that is, address forms that serve "to call the attention of an addressee in order to establish or maintain a relationship between this addressee and some proposition" (Lambrecht 1996: 267). For example, Tsur (2010: 512) observes that vocatives "stand outside the general syntactic patterning of language" and are typically related to the RH.³

2.2.3 Speaker Context

That linguistic expressions concerning attitudes, beliefs, and—most of all—emotions of the speaker in discourse are associated in some way with activation of the RH has been pointed out in a number of studies. This hemisphere is said to be dominant for an individual's awareness of his or her own corporeal being and its relation to the environment and to one's affective state (Beeman and Chiarello 1998; Devinsky 2000; see also Shamay-Tsoory et al. 2003). In the wording of Blonder et al. (1991: 1116), the RH "houses a lexical representation of emotions." Both imaging and clinical evidence suggest in fact that the RH is highly relevant for the comprehension and production of emotional features in speech (Bloom et al. 1992; Borod et al. 1998; Devinsky 2000; Friederici and Alter 2004; Mitchell and Crow 2005; Rota 2009). As has been established in a number of lesion studies, right brain damage (RHD) usually results in deficits in both the linguistic and the nonlinguistic comprehension and production of emotions (e.g., Borod et al. 1992, 1996, 1998, 2000, 2002; Breitenstein et al. 1998; Karow and Connors 2003; Myers 1999; Wager et al. 2003; Sherratt 2007). A number of neurolinguistic studies suggest in fact that inappropriate emotional behavior is predominantly associated with right frontal dysfunction (e.g., Joseph 2000), and Shammi and Stuss (1999) observe that individuals with RHD, especially when the injury reaches the frontal cortex, do not react physically to emotions (laughing or smiling).

There is also indirect evidence implicating the RH for the expression of emotion. For example, Kriendler and Fradis (1968: 111) observe that in all kinds of aphasia, motor articulation was dramatically better during "emotional speech."⁴ And Ley (1980) and Ley and Bryden (1983) found that the presentation of emotional words during a list learning task selectively improved memory of stimuli directed to the RH.

Note, however, that some brain-imaging studies suggest that the expression of emotion also implicates left lateralization (Wager et al. 2003: 527).⁵

There is one paradigm linguistic category, distinguished in some form or other in most if not all languages of the

world, that is dedicated to the expression of emotions, namely that of interjections. Already in research of the nineteenth century, severely aphasic speech of patients was found to be left essentially only with formulaic speech units such as expletives, interjections, and oaths (Van Lancker and Cummings 1999). Acknowledging that language and speech are typically related to the LH of the brain, Jakobson (1980: 23) adds that there are such verbal elements as interjections and exclamations that are typically associated with the RH. In the speech produced by two aphasic patients, reprinted by Van Lancker Sidtis (2009: 452), interjections were clearly the linguistic units most frequently produced by both the English-speaking and the German subjects suffering from LHD.

But RH activation is not restricted to the expression of emotions; it has also been shown to be reflected in the prosody of linguistic expressions. While prosodic processing requires a series of complex cognitive operations, there is evidence for a specialization of the RH for the processing of emotional prosody and of the LH for “linguistic” prosody (Walker et al. 2002; Ferré et al. 2011).⁶ Ross et al. (1997) analyzed the mechanisms underlying affective-prosodic deficits following left and right brain damage by testing the ability of subjects to repeat and comprehend affective prosody under progressively reduced verbal-articulatory conditions. They conclude that reducing verbal-articulatory conditions robustly improves the performance of left but not of right brain damaged patients, thus supporting the supposition that affective prosody is strongly lateralized to the RH.

Both lesion studies of stroke patients and functional imaging studies of healthy people show that the generation and/or comprehension of emotional prosody is mediated (more) by the RH rather than the LH (Bottini et al. 1994; Beeman and Chiarello 1998: 5; Mitchell and Crow 2005).

2.3 Preference for Formulaic Speech

A final major theme that surfaces in observations on hemisphere-based distinctions concerns that between propositional/compositional organization, on the one hand, and that of automatic/non-compositional linguistic expression, on the other. Patients with right hemisphere lesions have been found to be unable to perform holistic integration of feelings, situational cues, and interpersonal relations (Gardner 1975), and the right hemisphere has been associated with ritualized formulae and chunks of words (Springer and Deutsch 1983), as well as with patterns, configurations, and whole complex gestalts, with more efficient processing of the overall form and content than details or features (Kaplan et al. 1990). This distinction, which has been portrayed as one between an analytic and a holistic or gestalt mode of processing (Pawley 2009; Hellige 1990, 1993) or novel and formulaic speech (Van Lancker Sidtis 2009), figures in some form or other in a number of neurolinguistic studies, suggesting that the former mode is associated with LH activity whereas the latter is likely to implicate the RH.

Loss of propositional speech was reported in severely aphasic patients already in the nineteenth century: These patients were found to be left only with expletives, interjections, and oaths, and the word *no* was not used in its propositional but rather in an interjectional or emotional sense (see Van Lancker and Cummings 1999: 86 for more details). A noteworthy contrast between propositional (or “communicative”) and automatic (or “expressive”) speech was observed fairly early in work on patients suffering brain damage (Critchley 1970). Comparing the production of automatic and propositional speech in aphasic speakers, Graves and Landis (1985) conclude that automatic speech was produced by the RH. And Code (1996: 331) provides an overview of linguistic output observed in adults who have undergone a left hemispherectomy and concludes that utterances of the isolated RH consist primarily of automatic and nonpropositional speech.

The role of the RH in the processing of formulaic speech is analyzed most of all in various publications of Van Lancker Sidtis and associates within the framework of the dual process model (Van Lancker 1988, 1990, 1997; Van Lancker Sidtis 2004, 2009, 2012; Van Lancker Sidtis and Postman 2006; Sidtis et al. 2009). Central to this model is the distinction between novel speech (or novel language or newly created language, or propositional speech), on the one hand, and formulaic speech (or formulaic expressions or automatic speech), on the other. As argued by these authors on the basis of substantial neurological and linguistic evidence, novel speech is represented in the LH whereas formulaic speech is facilitated by a subcortical right hemisphere circuit.⁷ For instance, a study which examined the spontaneous speech of stroke patients showed that subjects with RH or subcortical damage produce a significantly smaller proportion of formulaic language compared to LHD or healthy speakers (Sidtis et al. 2009). The formulaic language investigated comprised the following categories: speech formulae (*don't be silly*), idioms (*kill two birds with a stone*), conventional expressions (*in the meantime*), sentence stems (*I think*), discourse

particles (*well*), pause fillers (*uh, um*), and proper nouns.

This hypothesis can be reconciled with observations made earlier according to which the LH is associated with “propositional thought” and the RH with “appositional thought.” Thus, Bogen and Bogen (1969) argue that the two sides of the brain utilize two different cognitive modes, one of which is propositional (analytic, digital) whereas the other is appositional (analogic, synthetic) or holistic. That the LH is associated with propositional language and new sentences and the RH with ritualized chunks of words has also been pointed out by Springer and Deutsch (1983).

A paradigm example is provided by the following patient diagnosed with global aphasia following a stroke that involved frontal, temporal, and parietal areas of the LH: He was unable to speak, name, or repeat, and his auditory-verbal language comprehension was severely limited. His linguistic production was restricted to automatic speech units, i.e. three formulae of social exchange (*yeah, yes, no*), two interjections (expletives, *goddammit, shit*), and one discourse marker (*well*). Note that these utterances were produced with good articulation and prosody (Van Lancker and Cummings 1999: 86).

2.4 Discussion

The data presented in this section raise a number of questions that are in need of further investigation. Our concern was generally with the RH but most neurolinguistic accounts that we were able to consult are not very specific about which part of the RH exactly is involved in the processing of linguistic communication, or of some particular discourse function. Note that the precise localization of functions is presumably more diffuse in the right than in the left hemisphere (Tompkins 1995; Myers 1999; on brain areas associated with salience and familiarity in language processing, see also Kasparian 2013: 14).

It would seem that the right middle temporal region is important for integrative processes needed to achieve global coherence during discourse processing, where “integration” means that multiple pieces of information are combined across sentences (St George et al. 1999: 1317, 1323). The right prefrontal cortex, on the other hand, is said to play a particular role in high language proficiency, as is suggested by research on word production by bilinguals (Videsott et al. 2010).

The expression of emotions appears to implicate most of all frontal brain regions. Thus, individuals with RHD injury were found not to react physically to emotions especially when the frontal cortex was concerned (Shammi and Stuss 1999), and right frontal dysfunction is said to be linked to “inappropriate” social and emotional behavior (Joseph 2000). In the processing of formulaic speech, on the other hand, it is the subcortical right hemisphere that is argued to play an important role (Van Lancker 1988, 1990, 1997; Van Lancker Sidtis 2004, 2009, 2012; Van Lancker Sidtis and Postman 2006; Sidtis et al. 2009). Overall, however, there are so far few generalizations on which particular part or circuit within or involving the RH is associated with which linguistic function.

But the main problem concerns the linguistic functions that have been hypothesized to be mainly or exclusively associated with RH activity, and here it is most of all the following questions:

(2)

- a. Is there a common denominator to the linguistic functions associated with the RH (as described in the preceding sections)?
- b. Are the discourse functions distinguished really the ones that are most central to right (rather than to left) hemisphere activity?

We have no answer to (2b). A wide range of functions beyond the ones mentioned above have been identified. One of these functions concerns topic maintenance. It has been argued that the content of discourse produced by RHD individuals tends to be characterized by reduced topic maintenance (Prutting and Kirchner 1987). While the evidence from participants after RHD stroke on this issue is inconclusive (Mackenzie and Brady 2008), the role of the RH in topic maintenance has been confirmed in fMRI studies (e.g. Caplan and Dapretto 2001).

A related issue concerns “left-dislocated” themes (or topics). For example, the English utterance (*As for Daisy, she has never been to Paris*, where *Daisy* is commonly treated as a “left-dislocated” theme (or topic), illustrates a construction type that can be found in a similar form in many languages of the world (see, e.g., Duranti and Ochs 1979 on Italian; Austin 1981 on Diyari; Newman 2000 on Hausa; Hieda 2014 on Kumam, or van Putten 2014 on

Avatime). What characterizes this construction type is in particular that the “left-dislocated” theme has the properties of a conceptual thetical, being syntactically unattached, prosodically set off from the rest of the utterance, etc. (see (3) of section 3.1). And in fact, looking at various kinds of neurolinguistic data, Van Lancker Sidtis (2009: 460) found that successful processing of theme and topic as properties of discourse units “require an intact right hemisphere.”

According to another observation there is a hemispheric distinction syntax vs. semantics. Wright et al. (2012), for example, found in their study of patients with left hemisphere lesions that syntactic performance correlated with tissue integrity and activity in a left fronto-temporal network. Semantic performance, by contrast, correlated with activity in right superior/middle temporal gyri, regardless of tissue integrity.⁸

These are but a few issues that have been discussed in neurolinguistic studies, suggesting that question (b) cannot be tackled in this paper, mainly for the following reason: The approach used here is restricted to linguistic analysis and most issues relating to the neural basis of brain lateralization are beyond the scope of this approach. Note further that the problem of whether the mechanisms underlying RHD are really cognitively rather than linguistically motivated is still largely unresolved (see e.g. Lehman Blake 2010; Myers 1999; Tompkins 2012; Sherratt and Bryan 2012; Kasparian 2013).

Our interest in this paper thus is with question (2a). This question requires more detailed discussion, which will be the subject of section 3.

3. Accounting for Neurolinguistic Data

In the preceding section, a number of general language-specific functions were identified that are hypothesized to implicate the RH of the human cortex. The question that we are concerned with in this section is how to relate these functions to linguistic theory, and more specifically: Is there a linguistic framework that would be of help in understanding the neurolinguistic observations summarized in section 2—in particular, is there some common denominator to all the linguistic functions associated with RH activity (section 2.4, (2a))? In this section we will look into this question from the perspective of Discourse Grammar.

3.1 An Outline of Discourse Grammar

Discourse Grammar, as proposed by Kaltenböck et al. (2011) and Heine et al. (2013), is composed of all the linguistic resources that are available for constructing spoken or written (or signed) texts.⁹ It is based on the assumption that there are two domains of discourse organization that need to be distinguished, referred to respectively as *Sentence Grammar* (SG) and *Thetical Grammar* (TG).

SG is well documented, having been the main or the only concern of theories of mainstream linguistics. It is based on propositional logic, and it is organized in terms of parts of speech or constituent types such as sentences, clauses, phrases, words, and morphemes plus the syntactic and morphological machinery to relate constituents and their meanings to one another. The building blocks of TG are *theticals*, consisting, on the one hand, of thetical formulae and constructions and, on the other hand, of expressions manifesting the ability to coopt text pieces of SG and deploy them for structuring discourse. Theticals differ from SG units in a principled way, their defining properties are listed in (3).¹⁰ Note that this definition is prototypical rather than being based on necessary and sufficient criteria (see also Kaltenböck et al. 2011: 853).

(3) Properties of theticals (Heine et al. 2013)

- a. They are syntactically unattached.
- b. They are typically set off prosodically from the rest of an utterance.
- c. Their meaning is nonrestrictive.
- d. They tend to be positionally mobile.¹¹
- e. Their internal structure is built on principles of SG but can be elliptic.

The relationship between the two domains of Discourse Grammar is complex; it is shaped most of all by cooptation, a mechanism whereby a chunk of SG, such as clause, a phrase, a word, or any other chunk is deployed for use in TG (Kaltenböck et al. 2011: 874–875). This means that one and the same linguistic expression can do service in

both domains. We may illustrate this with two examples involving an SG unit and a corresponding TG unit coopted from SG.

The first example concerns the English item *frankly*. It is an adverb of SG, determining the meaning of the predicate in (4a). In (4b), by contrast, it is a conceptual thetical,¹² called a disjunct by Quirk et al. (1985: 648, 613), a stance adverbial by Biber et al. (1999: 133), or a sentence adverb by Brinton and Traugott (2005: 139). As a thetical it is syntactically unattached, typically set off prosodically (e.g. marked off by commas in writing), and rather than determining the meaning of the predicate, its meaning “relates to the illocutionary act of saying *it’s a disgrace*” (Huddleston and Pullum 2002: 579–580) or, as we will say here, it relates to the situation of discourse rather than the structure of the sentence.

(4)

- a. *She spoke frankly about herself now and then.*
- b. **Frankly**, *it’s a disgrace.* (Biber et al. 1999: 132; Huddleston and Pullum 2002: 672)

The second example concerns the proper noun *Jim* in (5).

(5)

- a. *I don’t understand Jim.*
- b. *I don’t understand, **Jim**.*

In (5a), *Jim* is a unit of SG: It is syntactically and prosodically integrated and, being the object complement of the verb *understand*, it is part of the meaning of the clause. In (5b), by contrast, *Jim* (printed in bold) is a thetical, more specifically a vocative: It is syntactically unattached and positionally flexible, and it is typically set off prosodically from the preceding clause. And its meaning is not a syntactic part of the clause; rather, it is pragmatically accessible in what Lambrecht (1996: 268ff.) refers to as “the text-external world,” that is, a semantic space that is not normally covered by the meaning expressed by clauses or sentences (see below).

To conclude, the theticals *frankly* in (4b) and *Jim* in (5b) have a number of features in common, namely those of the definition in (3). In addition, both occur as doublets in that they have homophonous counterparts in (4a) and (5a), respectively—that is, *frankly* and *Jim* occur both as SG and as TG units, where the latter are coopted forms of the former (Kaltenböck et al. 2011: 874–875).

We noted above that the function of a vocative expression such as *Jim* in (5b) is not part of the syntactic or semantic structure of a sentence; instead, it is accessible in “the text-external world.” In more general terms, the functions of theticals, such as vocatives, discourse markers, comment clauses, reporting clauses, etc., have been characterized as metacommunicative, metatextual (Bayer 1973; Pittner 1995; Aijmer 1997: 3; Grenoble 2004: 1953; Furkó 2005; Frank-Job 2006: 397), metapragmatic (Auer and Günthner 2005: 340), metadiscursive (Hansen 1998: 236; Arroyo 2011: 858), or as belonging to the level of “metalanguaging” (Maschler 1994). What such terms refer to or allude to is that, rather than in the syntactic and semantic structure of a sentence, the functions of theticals are anchored in what may be portrayed as the pragmatic environment of linguistic communication. This pragmatic environment is described in the framework of Discourse Grammar with reference to the *situation of discourse*, which consists of a network of interlocking components, namely the ones listed in (6).

(6) Components of the situation of discourse (Kaltenböck et al. 2011: 861)

- a. Text organization
- b. Attitudes of the speaker
- c. Speaker-hearer interaction
- d. Source of information
- e. Discourse setting
- f. World knowledge

It is the components in (6), and most of all (6a–c), that determine the functions of theticals. As Table 1 shows, each of the main categories of TG distinguished is typically associated with one of these components. Quite commonly, however, more than one component is simultaneously involved (see below). Note that the examples in Table 1 are restricted to formulaic (i.e., largely or entirely invariable, noncompositional) theticals. These form only one type of theticals, as we will see in the next section.

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Of the six components distinguished in (6), only three are exemplified in Table 1, namely text organization, speaker-hearer interaction, and attitudes of the speaker. It is in fact these three that account for the functions of most theticals, and our discussion in the next section will be restricted to them.¹³

Table 1. The main functional components of some formulaic theticals (see Kaltenböck et al. 2011)

Category	Examples of formulaic English theticals	Main component of the situation of discourse involved (cf. (6))
Conceptual theticals	<i>as it were, for example, I think, if you will, that is, you know</i>	Text organization
Formulae of social exchange	<i>alright, Goodbye, happy birthday, hi, never mind, please, sorry</i>	Speaker-hearer interaction
Vocatives	<i>Ann!, Waiter!, Ladies and Gentlemen!</i>	Speaker-hearer interaction
Imperatives	<i>Come on!, Give me a drink!, Listen!, Watch out!</i>	Speaker-hearer interaction
Interjections	<i>Damn, oh, ouch, whoopee, wow</i>	Attitudes of the speaker

3.2 Relating Thetical Grammar to the Right Hemisphere

As we argue in this section, each of the three components of the situation of discourse distinguished in Table 1 exhibits principal correlations with the general functions that were identified in the neurolinguistic research summarized in section 2. Table 2 provides a list of these correlations.¹⁴

Table 2. Correlations between functions of neurolinguistic processing and components of the situation of discourse

Neurolinguistic function (section 2)		Component of the situation of discourse (section 3.1, (6))
Pragmatic anchoring of discourse	a. Discourse context	Text organization
	b. Social context	Speaker-hearer interaction
	c. Speaker context	Attitudes of the speaker

We will now deal with each of the components in turn.

3.2.1 Text Organization

Both domains of Discourse Grammar distinguished in section 3.1 are concerned with text organization, but there is a major difference between Sentence Grammar (SG) and Thetical Grammar (TG). This difference has been described as one between restrictive and nonrestrictive meaning (Heine et al. 2013: 182–185; cf. (3) above), between micro-grammar and macro-grammar (Haselow 2014), or between languaging and metalanguaging (Maschler 1994). Whereas Sentence Grammar is concerned with the propositional structure of clauses and sentences, Thetical Grammar concerns the planning and structuring of linguistic discourse beyond the sentence.

To integrate parts of a text into a coherent whole or to build a mental model of discourse thus is one of the tasks associated with Thetical Grammar, and it was also described in section 2.2.1 as one of the functions associated with RH activity.

The way text cohesion is achieved is mainly by means of conceptual theticals. These may be invariable, formulaic expressions, such as the ones listed in Table 1; but they may as well be novel, freely formed expressions coopted from Sentence Grammar, like *angry at the delay* in (7). What they all have in common is that they share the properties listed in (3), that is, they are essentially outside the confines of Sentence Grammar.¹⁵

(7) *The editor, **angry at the delay**, resigned from the project.* (Huddleston and Pullum 2002: 1359)

Conceptual theticals serve a wide range of functions, such as providing explanations, as in (7), or further information (8), foregrounding some part of discourse (9), commenting on the preceding discourse (10), or placing the content of an utterance in a wider context (11).

(8) *The company commander, **that is to say** Captain Madison, assembled his men and announced their mission.* (Quirk et al. 1985: 1309)

(9) *nor is it uh legitimate for us to acquire **and I underline the word acquire** Iraqi territory* (ICE-GB: s1b-027 #54)¹⁶

(10) ***To conclude**, we may place the three notions of saliency in an ordered relation as follows <...>.* (Biber et al. 1999: 876)

(11) *This hypothesis, **by now adopted by most psychologists**, is based entirely on guesswork.*

Conceptual theticals such as *and I underline the word acquire* in (9), are *instantaneous theticals*: They can be designed freely on the basis of principles of Sentence Grammar (Heine et al. 2013). But arguably the paradigm instrument for establishing cohesion between larger parts of discourse is provided by *formulaic conceptual theticals*, and in particular by discourse markers (Östman 1995), such as *actually* (Lenk 1998; Smith and Jucker 2000; Taglicht 2001; Clift 2001; Aijmer 1988, 1997, 2002), *anyway* (Ferrara 1997; Park 2010), *of course* (Wichmann et al. 2010), *mind you* (Bell 2009), *now* (Aijmer 1998, 2002, 2013; Schourup 2011), *so* (Schiffrin 1987: 191–227; Howe 1991; Johnson 2002; Bolden 2009), or *well* (Schiffrin 1987: 102–127; Jucker 1997; Aijmer and Simon-Vandenberg 2003; González 2004; Cuenca 2008; Aijmer 2013). Discourse markers have been described as serving to establish coherence between text pieces, to address functions of information structure, and to elaborate on or modify the text (see, e.g., Östman 1995; Fraser 1999), cf. the discourse marker *after all* in (12).

(12) *Mary has gone home. **After all**, she was sick.* (Aijmer and Simon-Vandenberg forthcoming.)

To be sure, Sentence Grammar with its highly flexible syntactic and semantic potential is able to convey virtually any conceptual content, including functions such as the ones mentioned above, but there are severe limitations. First, expressing such functions would require considerably more processing effort and expenditure. For example, the English discourse marker *actually* has been described as expressing functions such as the following, depending on the co(n)text in which it is used: (a) surprise, (b) distancing from the factuality of an earlier utterance, (c) mild contradiction, (d) change in hearer's perspective, (e) polite softening, (f) change in discourse topic, (g) incompatibility between two propositions, and (h) expressing a contrast (Lenk 1998; Smith and Jucker 2000; Taglicht 2001; Aijmer 2002). Using the propositional format of Sentence Grammar for processing such functions would presumably require considerably more morphological and syntactic expenditure than is needed for a simple, unanalyzable discourse marker such as *actually*.

And second, there are a number of discourse functions, including some of those mentioned for *actually*, for which no dedicated (i.e., function-specific) categories exist in Sentence Grammar and which can be expressed essentially only by means of theticals. This applies in particular but not only to discourse markers; it would be hard to find appropriate Sentence Grammar equivalents for the range of text organizing functions associated with the use of English discourse markers such as *actually*, or *after all* in (12). Discourse markers also have the advantage of being multifunctional and highly adaptable to their specific contexts of use as a result of their firm anchoring in the situation of discourse. This allows for more efficient fine-tuning to contextual requirements—at comparatively little processing cost—than could be achieved by units of Sentence Grammar (for another example involving the discourse marker *well*, see section 3.3).

In addition to discourse markers there is another category of items serving the structuring of texts, namely fillers (or hesitation markers, or interjective hesitators) such as English *uh* and *um*. As some recent lines of research suggest, fillers are to some extent used for discourse management in a similar way as discourse markers (Clark and Fox Tree 2002; O'Connell and Kowal 2005; Tottie 2011, 2014, 2015).

To conclude, fillers, discourse markers, and other conceptual theticals appear to be devoted exactly to the expression of functions that have been described as being suggestive of RH activity, such as processing higher level information (e.g., the integration of parts into a coherent whole) (Robertson et al. 2000); it involves in fact what in the neurolinguistic literature alluded to in section 2.2.1 is referred to as the “macrostructure” of discourse.

3.2.2 Speaker-Hearer Interaction

We saw in section 2.2.2 that the social context of linguistic communication appears to be strongly associated with RH activity (e.g., Berman et al. 2003). Accordingly, persons suffering right hemisphere damage have been described as being socially disconnected from the world around them, showing inappropriate social behavior, taking little account of their communicative partner, and as having an impaired appreciation of the hearer's needs.

Sentence Grammar provides some grammatical tools for speaker-hearer interaction. Personal pronouns are important to define the roles of interlocutors vis-à-vis one another, and verbal categories of modality enable the speaker to involve the hearer in the discourse. But linguistic expressions dedicated exclusively to the social context of linguistic communication are essentially reserved for Thetical Grammar. This concerns, on the one hand, freely designed conceptual theticals, such as the one printed in bold in (13).¹⁷

13) *Or are you being <,> uhm <,> **please don't misunderstand me when I say this** <,> over-taught that is to say <,> being asked to attend <,> more lectures more seminars more tutorials than you can prepare for* (DCPSE: DL-A03-0355)

On the other hand, and most important, it concerns some types of formulaic expressions. One type of conceptual theticals is that of question tags, which involve the hearer in the content of an utterance (Tottie and Hoffmann 2006; Axelsson 2011), as in (14). And there are also a number of discourse markers whose primary function it is to relate an utterance to the social context and the interaction of the speaker with the hearer, in particular, *if you will* (Brinton 2008: 163–166), *you see* (Brinton 2008: 134–136), and *you know* (Fox Tree and Schrock 2002).

(14) *She's so generous, **isn't she?*** (Biber et al. 1999: 208)

Other types were listed in Table 1, namely formulae of social exchange, vocatives, and imperatives. We saw in section 2.2.2 that these are exactly the items that tend to be present in persons suffering from left hemisphere damage but to be absent in persons with right hemisphere damage (e.g., Van Lancker Sidtis 2009).

To conclude, linguistic expressions dedicated to the exchange among interlocutors and to relating the speaker to his or her social environment are almost exclusively located within the domain of TG. Thus, with reference to section 2.2.2, there appears to be a strong correlation between the component of speaker-hearer interaction of Discourse Grammar and what is referred to in the neurolinguistic literature as the social context of linguistic communication (Berman et al. 2003) and successful social communication (Mitchell and Crow 2005).

3.2.3 Attitudes of the Speaker

In section 2.2.3, we saw that a paradigm function associated with RH activity, pointed out by a number of authors, is that of emotions—as Blonder et al. (1991: 1116) suggest, the RH “houses a lexical representation of emotions.” Irrespective of whether or to what extent parts of the LH may be involved, the linguistic expression of emotive concepts appears to be associated in some way with RH activity.

There is an immediate correlation in Thetical Grammar: The primary, or even the only linguistic category dedicated to the expression of emotions is provided cross-linguistically by the thetical category of interjections, that is, invariable and syntactically unattached linguistic forms that typically index a change in the emotional or cognitive state of the speaker (Ameka 1992: 867; Norrick 2009: 876).¹⁸ Interjections are usually short, unanalyzable expressions, but they may also have a clausal or phrasal structure, like *oh my goodness* and *jiminy christmas* in the following text piece.

(15)

- a. Armrel: *is this Debbie's?*
- b. Debbie: *yeah, that's fine, you've got to hear Vicki's too.*
- c. Vicky: *okay.*
- d. Armrel: ***oh my goodness, you're busy, jiminy christmas.*** (LSWEC-AC, 133003; Norrick 2009: 888)

Furthermore, the component attitudes of the speaker surfaces in a wide range of conceptual theticals interpolated in the text, adding information on the speaker's cognitive or emotional state, opinion, assessment, etc.:

(16)

- a. *The photograph I thought was absolutely terrible* (ICE-GB: s2a-027-64)
- b. *... most farmers are very happy I'm glad to say to give access to the country to people...* (ICE-GB: s1b-037-68)
- c. *Jill—and I don't blame her—left before the meeting had ended.* (Huddleston and Pullum 2002: 1350)
- d. *It is also, perversely enough, an unintended validation of Chomsky's disruptive agenda.* (T. Givón, Funknet circular of 12-03-2010)

The components of the situation of discourse listed in (6) were called interlocking, that is, theticals are not necessarily confined to one component but rather may concern simultaneously more than one component. For example, the conceptual thetical *I'm afraid* below can, on the one hand, be interpreted as expressing the speaker's attitude, on the other hand, it can also be interpreted, for example, as a kind of apology, that is, as serving speaker-hearer interaction:

- (17) *I've got to go I'm afraid in an hour.* (ICE-GB: s1a-045-216)

3.3 Other Possible Correlations

We saw in the preceding paragraphs that there are some striking correlations between certain functions identified in neurolinguistic work and corresponding functions expressed by categories of Thetical Grammar (TG): Functions that concern the building of a mental model of discourse (2.2.1) directly correspond to the component of text organization in TG (3.2.1), while functions relating to the social context (2.2.2) have speaker-hearer interaction (3.2.2), and functions relating to the speaker context (2.2.3) the component of attitudes of the speaker (3.2.3) as their immediate equivalent in Discourse Grammar (see Table 2).

But this does not exhaust the range of functions that we observed in section 2. There were in particular two more kinds of functions associated with the RH that were not further discussed in the preceding account. One of them concerns semantic relationship. As was observed in section 2.2.1, neurolinguistic research findings suggest that closely related meanings of linguistic expressions are likely to implicate the LH, whereas distantly related meanings, including inferencing and the handling of nonliteral meaning, are more likely to involve RH activity.

How such findings can be related to the distinction between SG and TG in Discourse Grammar is a question for future research. Nevertheless, there is a tentative answer. Being concerned with the structure of sentences and their propositional semantic format, SG is constrained in the way meanings of words and constituents can be expressed and combined. TG is not subject to such kinds of constraints. Since theticals are anchored in the situation of discourse rather than the structure of a sentence, their meaning is—much more than that of SG units—dependent on the context in which they are used.

We may illustrate this with the example of discourse markers, that is, a common type of theticals. The English word *well* is an adverb of SG but it also has a counterpart in TG, serving as a discourse marker. The two co-occur in the following constructed example (the discourse marker is printed in bold):

(18)

- a. *What did your friend say?*
- b. ***Well,*** *I didn't understand him very well.*

Whereas the adverb has a fairly well described meaning, serving as a modifier of the verb *understand* in (18b), the

meaning of the discourse marker is more difficult to describe. For example, Jucker (1997) identifies the following meanings (or functions) of the discourse marker *well*: (a) frame marker indicating a topic change, (b) a face-threat mitigator, (c) a qualifier, indicating some problems on the content level of the current or the preceding utterance, and (d) a pause filler.¹⁹ It would be hard to find a common denominator to all the meanings identified. What this example shows is, first, that the meaning of theticals such as discourse markers is more complex than that of corresponding SG units and, second, that this meaning is shaped not by its semantic link to another element of SG but rather by the situation of discourse, commonly described as the “context.” Thus, the meaning of the discourse marker *well* involves, on the one hand, the component of text organization (cf. (a), (c), (d)) and, on the other hand, that of speaker-hearer interaction (cf. (b)), and a similar analysis can be proposed for the discourse markers *after all* and *actually* that were discussed in section 3.2.1.

Accordingly, processing the meanings of theticals presupposes inferential mechanisms far beyond those required for corresponding words and expressions of SG. In this sense it would seem safe to conclude that semantic relationship is clearly more constrained in SG than in TG. To conclude, there appears to be another positive correlation between RH activity (section 2.1) and language processing in the domain of TG.

The second range of functions observed in section 2 but not taken care of in that section concerns the preference for formulaic speech in RH activity (section 2.3): The right hemisphere tends to involve synthetic, holistic, and formulaic thought and configurational recognition (Bogen and Bogen 1969; Bradshaw and Nettleton 1983; Hellige 1993; Van Lancker Sidtis 2009, 2004: 31; cf. the rich data supporting this hypothesis in the work of Van Lancker Sidtis and associates). Formulaic (noncompositional) information units, such as interjections, formulae of social exchange, discourse markers, or comment clauses, are in fact mostly theticals (Heine et al. 2013)—hence, there is another strong correlation between RH activity and TG. However, formulaic units are not restricted to TG, there are also many to be found in SG. For example, idiomatic expressions such as *kick the bucket*, *spill the beans*, *commit suicide*, etc. are noncompositional expressions, but they are syntactically and prosodically part of a sentence, that is, they do not conform to our definition in (3). Hence they are not theticals but rather belong to SG.

Accordingly, the correlation between formulaic speech units and theticals is quantitative rather than absolute, it appears to be an epiphenomenal product of the particular discourse structure of TG. For example, being used frequently for recurring discourse functions, many theticals become highly predictable expressions, they lose their morphosyntactic compositionality and may be shortened, and turn into fixed speech act formulas (Pawley 2009) expressing stereotypic functions grounded in the situation of discourse (for more detailed discussion, see Heine 2013). For example, the expression *God be with you!* was coopted and subsequently grammaticalized to an information unit of TG as a formula of social exchange, it became restricted to one stereotypic discourse function, namely farewell giving, and was eventually reduced to *Godbye!*

In other words, the reason why theticals tend to be formulaic is that due to their frequent use for a narrow range of discourse functions they become highly predictable and subsequently frozen into fixed, noncompositional and short expressions. The reason why, on the other hand, not all formulaic expressions are theticals concerns the fact that it is not only thetical expressions—that is, expressions the function of which is to organize discourse and to ground it in a particular pragmatic context—that are used frequently but also SG units, which, too, may come to be highly predictable and subsequently formulaic. What is crucial for the present discussion is the fact that formulaic speech exhibits significant overlaps with formulaic theticals. Following Heine et al. (2014), the explanation we can offer for this is that both of them result from a process whereby information units are used recurrently on account of some salient discourse function and, as a consequence, turn into formulaic information units that tend to become frozen short structures. Since such discourse functions relate—most of the time—to the situation of discourse, it is only natural that the majority of these units are theticals. It is clear, however, that more research is needed on this general issue.

4. Conclusions

In section 2.4 the question was raised whether there is some common denominator to the linguistic functions associated with right hemisphere participation. Three main kinds of function were identified in section 2.2. If there is in fact a common denominator, then it concerns the anchoring of these functions in the situation of discourse, that is, in pragmatics rather than in the syntax or semantics of a sentence. Section 3 showed that, rather than Sentence

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Grammar, all these functions concern the domain of Thetical Grammar. Thus, there is a striking correlation between the observations made in neurolinguistic work on brain lateralization and those made independently in the framework of Discourse Grammar.

Furthermore, we pointed out that this correlation might extend to other linguistic characteristics associated with hemispheric lateralization, namely the distinction close vs. distant semantic relationship (section 2.1), on the one hand, and novel/compositional vs. formulaic/non-compositional forms of linguistic expression (2.3), on the other. As we suggested in section 3.3, the ability to relate distantly related meanings to one another and preference for formulaic speech might both be derivative of the particular nature of Thetical Grammar. With its ability to relate the linguistic discourse to its pragmatic environment beyond the limits of syntax and the propositional structure of clauses and sentences (cf. 3.2.1), Thetical Grammar is able to activate inferential mechanisms that allow it to establish links between seemingly “unrelated” meanings. And since Thetical Grammar is favored in, though by no means restricted to, standard settings of social encounters it encourages the recurrent use of formulaic speech and other frequently used collocations of linguistic expression.

The hypothesis proposed in this paper raises a number of problems that could not be solved. One problem concerns the analysis and evaluation of neurolinguistic findings. First, as we mentioned in section 2, language dominance does not appear to be exclusively a matter of the left hemisphere (e.g., Knecht et al. 2000). Second, most, if not all, language components include both left- and right-hemisphere processes (Beeman and Chiarello 1998). Third, the two hemispheres appear to have mutually supportive functions (Helmstaedter et al. 1994: 735). Fourth, speech-specific processing has been argued to emerge at the level of functional connectivity among distributed brain regions, each of which participates in processes that are engaged by both speech and nonspeech tasks, rather than involving “macro-anatomical structures in the human brain dedicated to speech” (Price et al. 2006: 271). Fifth, rather than between the right and the left hemisphere, functional dissociation has been claimed to concern the distinction between a distributed bilateral domain relating to general perceptual and cognitive processing, on the one hand, and a more specialized left hemisphere domain supporting key grammatical language functions, on the other (Bozic et al. 2010). And finally, we were not able to deal with a number of variables that have been shown to have a bearing on hemisphere-related differential discourse processing, such as the distinction between production and comprehension (Hagoort and Poeppel 2013).

Nevertheless, on the basis of the evidence presented it would seem safe to conclude that in the same way that Sentence Grammar is unlikely to be activated without a participation of the left hemisphere, it is equally unlikely that the activation of Thetical Grammar phenomena can be achieved without any participation of the right hemisphere.

Another problem concerns the role of Discourse Grammar in the analysis of linguistic phenomena that are sensitive to hemispheric lateralization. Most previous work on neurolinguistic research was based on models highlighting what is called here Sentence Grammar and in particular the form, meaning, and information structure of sentences and their constituents. While the analysis of text structure has also received quite some attention in some of these works (e.g., Bloom et al. 1992, 1993; Marini et al. 2005, 2011; Marini 2012; Sherratt and Bryan 2012), Thetical Grammar has so far not been perspectivized in this work. An important task for future research therefore is to explore how the hypothesis proposed here can be substantiated by means of more detailed empirical studies.

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References

Aijmer, Karin. 1988. “Now may we have a word on this”: the use of “now” as a discourse particle. In M. K. Ossi and

On Some Correlations between Grammar and Brain Lateralization

- I. M. Rissanen (eds.), *Corpus Linguistics, Hard and Soft: Proceedings of the 8th International Conference on English Language Research on Computerized Corpora*. Amsterdam: Rodopi. Pp. 15–34.
- Aijmer, Karin. 1997. “I think”—an English modal particle. In T. Swan and O. Jansen-Westvik (eds.), *Modality in Germanic Languages: Historical and Comparative Perspectives*. Berlin, New York: Mouton de Gruyter. Pp. 1–47.
- Aijmer, Karin. 2002. *English Discourse Particles: Evidence from a Corpus*. Amsterdam, Philadelphia: John Benjamins.
- Aijmer, Karin. 2013. *Understanding Pragmatic Markers: A Variational Pragmatic Approach*. Edinburgh: Edinburgh University Press.
- Aijmer, Karin, and Anne-Marie Simon-Vandenberg. 2003. The discourse particle “well” and its equivalents in Swedish and Dutch. *Linguistics* 41, 1: 1123–1161.
- Aijmer, Karin, and Anne-Marie Simon-Vandenberg. Forthcoming. Pragmatic markers. *Handbook of Pragmatics*.
- Ameka, Felix. 1992. Interjections: The universal yet neglected part of speech. *Journal of Pragmatics* 18: 101–118.
- Anaki, D., M. Faust, and S. Kravetz. 1998. Cerebral hemispheric asymmetries in processing lexical metaphors. *Neuropsychologia* 36, 4: 353–362.
- Arambel, S., and C. Chiarello. 2006. Priming nouns and verbs: Differential influences of semantic and grammatical cues in the two cerebral hemispheres. *Brain and Language* 97: 12–24.
- Arroyo, José Luis Blas. 2011. From politeness to discourse marking: The process of pragmaticalization of *muy bien* in vernacular Spanish. *Journal of Pragmatics* 43: 855–874.
- Auer, Peter, and Susanne Günthner. 2005. Die Entstehung von Diskursmarkern im Deutschen—ein Fall von Grammatikalisierung? In Torsten Leuschner, Tanja Mortelmans, and Sarah De Groot (eds.), *Grammatikalisierung im Deutschen*. Linguistik—Impulse & Tendenzen 9. Berlin, New York: Walter de Gruyter. Pp. 335–362.
- Austin, Peter. 1981. *A Grammar of Diyari, South Australia*. Cambridge: Cambridge University Press.
- Axelsson, Karin. 2011. A cross-linguistic study of grammatically-dependent question tags: Data and theoretical implications. *Studies in Language* 35, 4: 793–851.
- Bayer, Klaus. 1973. Verteilung und Funktion der sogenannten Parenthese in Texten. *Deutsche Sprache* 1: 64–115.
- Beeman, Mark. 1998. Coarse semantic coding and discourse comprehension. In Mark Beeman and Christine Chiarello (eds.), *Right Hemisphere Language Comprehension: Perspectives from Cognitive Neuroscience*. Mahwah, NJ: Lawrence Erlbaum. Pp. 255–284.
- Beeman, Mark, and Christine Chiarello. 1998. Complementary right- and left-hemisphere language comprehension. *Current Directions in Psychological Science* 7, 1: 1–8.
- Beeman, see also Jung-Beeman.
- Bell, David M. 2009. Mind you. *Journal of Pragmatics* 41: 915–920.
- Berman, Steven M., Mark A. Mandelkern, Hao Phan, and Eran Zaidel. 2003. Complementary hemispheric specialization for word and accent detection. *NeuroImage* 19: 319–331.
- Biber, Douglas, Stig Johansson, Geoffrey Leech, Susan Conrad, and Edward Finegan. 1999. *Longman Grammar of Spoken and Written English*. London: Longman.
- Blake, M. L. 2006. Clinical relevance of discourse characteristics after right hemisphere brain damage. *American Journal of Speech-Language Pathology* 15, 3: 255–267.
- Blake, M. L. 2009a. Inferencing processes after right hemisphere brain damage: Maintenance of inferences. *Journal of Speech, Language, and Hearing Research* 52, 2: 359–372.

On Some Correlations between Grammar and Brain Lateralization

- Blake, M. L. 2009b. Inferencing processes after right hemisphere brain damage: Effects of contextual bias. *Journal of Speech, Language, and Hearing Research* 52, 2: 373–384.
- Blonder, Lee Xenakis, Dawn Bowers, and Kenneth M. Heilman. 1991. The role of the RH in emotional communication. *Brain* 114, 3: 1115–1127.
- Bloom, R. 1994. Hemispheric responsibility and discourse production: Contrasting patients with unilateral left and right hemisphere damage. In R. Bloom, L. Obler, S. De Santi, and J. Ehrlich (eds.), *Discourse Analysis and Applications: Studies in Adult Clinical Populations*. Hillsdale, NJ: Erlbaum. Pp. 81–94.
- Bloom, R., J. Borod, Loraine K. Obler, and L. Gerstman. 1992. Impact of emotional content on discourse production in patients with unilateral brain damage. *Brain and Language* 42: 153–164.
- Bloom, R. L., J. C. Borod, L. K. Obler, and L. J. Gerstman. 1993. Suppression and facilitation of pragmatic performance: Effects of emotional content on discourse following right and left brain damage. *Journal of Speech and Hearing Research* 36, 6: 1227–1235.
- Bogen, J. E., and G. M. Bogen. 1969. The other side of the brain III: The Corpus Callosum and creativity. *Bull. L. A. Neurol. Society* 34: 175–195.
- Bolden, Galina B. 2009. Implementing incipient actions: The discourse marker “so” in English conversation. *Journal of Pragmatics* 41: 974–998.
- Borod, J. C., F. Andelman, L. K. Obler, J. R. Tweedy, and J. Welkowitz. 1992. Right hemisphere specialization for the identification of emotional words and sentences: Evidence from stroke patients. *Neuropsychologia* 30, 9: 827–844.
- Borod, J. C., R. L. Bloom, A. M. Brickman, L. Nakhutina, and E. A. Curko. 2002. Emotional processing deficits in individuals with unilateral brain damage. *Applied Neuropsychology* 9, 1: 23–36.
- Borod, J., R. Bloom, and C. Santschi Haywood. 1998. Verbal aspects of emotional communication in the right cerebral hemisphere. In Mark Beeman and Christine Chiarello (eds.), *Right Hemisphere Language Comprehension: Perspectives from Cognitive Neuroscience*. Hillsdale, NJ: Lawrence Erlbaum Associates. Pp. 285–307.
- Borod, J. C., K. D. Rorie, C. S. Haywood, F. Andelman, L. K. Obler, J. Welkowitz, et al. 1996. Hemispheric specialization for discourse reports of emotional experiences: Relationships to demographic, neurological and perceptual variables. *Neuropsychologia* 34, 5: 351–359.
- Borod, J. C., K. D. Rorie, L. H. Pick, R. L. Bloom, F. Andelman, A. L. Campbell, et al. 2000. Verbal pragmatics following unilateral stroke: Emotional content and valence. *Neuropsychology* 14, 1: 1–13.
- Bottini, G., R. Corcoran, R. Sterzi, E. Paulesu, P. Schenone, P. Scarpa, et al. 1994. The role of the RH in the interpretation of figurative aspects of language. *Brain* 117: 1241–1253.
- Bozic, Mirjana, Lorraine K. Tyler, David T. Ives, Billi Randall, and William D. Marslen-Wilson. 2010. Bihemispheric foundations for human speech comprehension. *PNAS (Proceedings of the National Academy of Sciences)* 107, 40: 17439–17444.
- Bradshaw, J. L., and N. C. Nettleton. 1983. *Human Cerebral Asymmetry*. Englewood Cliffs, NJ: Prentice-Hall.
- Brady, M., L. Armstrong, and C. Mackenzie. 2006. An examination over time of language and discourse production abilities following right hemisphere brain damage. *Journal of Neurolinguistics* 19, 4: 291–310.
- Branch, C., B. Milner, and T. Rasmussen. 1964. Intracarotid sodium amytal for the lateralization of cerebral speech dominance. *Journal of Neurosurgery* 21: 399–405.
- Breitenstein, C., I. Daum, and H. Ackermann. 1998. Emotional processing following cortical and subcortical brain damage: Contribution of the fronto-striatal circuitry. *Behavioural Neurology* 11: 29–42.
- Bridges, Kelly A., Diana Van Lancker Sidtis, and John J. Sidtis. 2013. The role of subcortical structures in recited speech: Studies in Parkinson’s disease. *Journal of Neurolinguistics* 26: 591–601.

On Some Correlations between Grammar and Brain Lateralization

- Brinton, Laurel J. 2008. *The Comment Clause in English: Syntactic Origins and Pragmatic Development*. Studies in English Language. Cambridge: Cambridge University Press.
- Brinton, Laurel J., and Elizabeth C. Traugott. 2005. *Lexicalization and Language Change*. Cambridge: Cambridge University Press.
- Brownell, H. H., H. H. Potter, and A. M. Bihle. 1986. Inference deficits in right brain-damaged patients. *Brain and Language* 27, 2: 310–321.
- Burgess, C., and G. B. Simpson. 1988. Cerebral hemispheric mechanisms in the retrieval of ambiguous word meanings. *Brain and Language* 33: 86–104.
- Cancelliere, A. E., and A. Kertesz. 1990. Lesion localization in acquired deficits of emotional expression and comprehension. *Brain and Cognition* 13, 2: 133–147.
- Caplan, R., and M. Dapretto. 2001. Making sense during conversation: An fMRI study. *Neuro Report* 12, 16: 3625–3632.
- Champagne-Lavau, M., and Y. Joanette. 2009. Pragmatics, theory of mind and executive functions after a right-hemisphere lesion: Different patterns of deficits. *Journal of Neurolinguistics* 22, 5: 413–426.
- Chantraine, Y., Y. Joanette, and B. Ska. 1998. Conversational abilities in patients with right hemisphere damage. *Journal of Neurolinguistics* 11, 1–2: 21–32.
- Chiarello, Christine. 1991. Meanings by cerebral hemispheres: One is not enough. In P. J. Schwanenflugel (ed.), *The Psychology of Word Meanings*. Hillsdale, NJ: Lawrence. Pp. 251–278.
- Chiarello, Christine. 1995. Does the corpus callosum play a role in the activation and suppression of ambiguous word meanings? In F. L. Kitterle (ed.), *Hemispheric Communication: Mechanisms and Models*. Hillsdale, NJ: Lawrence Erlbaum. Pp. 177–188.
- Chiarello, Christine. 1998. On codes of meaning and the meaning of codes: Semantic access and retrieval within and between hemispheres. In Mark Jung-Beeman and Christine Chiarello (eds.), *Right Hemisphere Language Comprehension: Perspectives from Cognitive Neuroscience*. Mahwah, NJ: Lawrence Erlbaum. Pp. 141–160.
- Chiarello, Christine, C. Burgess, L. Richards, and A. Pollock. 1990. Semantic and associative priming in the cerebral hemispheres: Some words do, some words don't sometimes, some places. *Brain and Language* 38: 75–104.
- Clark, Herbert H. 1996. *Using Language*. Cambridge: Cambridge University Press.
- Clark, Herbert H., and Jean E. Fox Tree. 2002. Using uh and um in spontaneous speaking. *Cognition* 84: 73–111.
- Clift, Rebecca. 2001. Meaning in interaction: The case of *actually*. *Language* 77, 2: 245–291.
- Code, C. 1996. Speech from the isolated right hemisphere? Left hemispherectomy cases E.G. and N.F. In C. Code, C. W. Wallesch, Y. Joanette, and A. R. Lecours (eds.), *Classic Cases in Neuropsychology*. Mahwah, NJ: Lawrence Erlbaum. Pp. 319–336.
- Critchley, M. 1970. *Aphasiology and Other Aspects of Language*. London: Edward Arnolds.
- Cuenca, Maria-Josep. 2008. Pragmatic markers in contrast: The case of *well*. *Journal of Pragmatics* 40: 1373–1391.
- Cutica, I., M. Bucciarelli, and B. G. Bara. 2006. Neuropragmatics: Extralinguistic pragmatic ability is better preserved in left-hemisphere-damaged patients than in right-hemisphere-damaged patients. *Brain and Language* 98, 1: 12–25.
- Devinsky, Orrin. 2000. Right cerebral hemisphere dominance for a sense of corporeal and emotional self. *Epilepsy and Behavior* 1, 1: 60–73.
- Drews, E. 1987. Quantitatively different organization structure of lexical knowledge in the left and right hemisphere. *Neuropsychologia* 25: 419–427.

On Some Correlations between Grammar and Brain Lateralization

- Duranti, Alessandro, and Elinor Ochs. 1979. Left-dislocation in Italian conversation. In T. Givón (ed.), *Discourse and Syntax*. Syntax and Semantics, 12. New York: Academic Press. Pp. 377–416.
- Faust, Miriam, and Christine Chiarello. 1998. Sentence context and lexical ambiguity resolution by the two hemispheres. *Neuropsychologia* 36, 9: 827–835.
- Ferrara, Kathleen. 1997. Form and function of the discourse marker *anyway*: Implications for discourse analysis. *Linguistics* 35, 2: 343–378.
- Ferré, Perrine, Bernadette Ska, Camille Lajoie, Amélie Bleau, and Yves Joanette. 2011. Clinical focus on prosodic, discursive and pragmatic treatment for right hemisphere damaged adults: What's right? *Rehabilitation Research and Practice* 2011: 1–10.
- Fox Tree, Jean E., and Josef C. Schrock. 2002. Basic meanings of *you know* and *I mean*, *Journal of Pragmatics* 34: 727–747.
- Frank-Job, Barbara. 2006. A dynamic-interactional approach to discourse markers. In Kerstin Fischer (ed.), *Approaches to Discourse Particles*. Amsterdam: Elsevier. Pp. 359–374.
- Fraser, Bruce. 1999. What are discourse markers? *Journal of Pragmatics* 31: 931–952.
- Friederici, A. D., and K. Alter. 2004. Lateralization of auditory language functions: A dynamic dual pathway model. *Brain and Language* 89, 2: 267–276.
- Furkó, Bálint Péter. 2005. The pragmatic marker—discourse marker dichotomy reconsidered: The case of *well* and *of course*. Ph.D. dissertation, Debreceni Egyetem, Bölcsészettudományi Kar, Debrecen.
- Gagnon, L., P. Goulet, F. Giroux, and Y. Joanette. 2003. Processing of metaphoric and non- metaphoric alternative meanings of words after right- and left-hemispheric lesion. *Brain and Language* 87: 217–226.
- Gardner, H. 1975. *The Shattered Mind*. New York: Knopf.
- Gernsbacher, M. 1990. *Language Comprehension as Structure Building*. Hillsdale, NJ: Erlbaum.
- Giora, R., E. Zaidel, N. Soroker, G. Batori, and A. Kasher. 2000. Differential effects of right- and left-hemisphere damage on understanding sarcasm and metaphor. *Metaphor & Symbol* 15, 1–2: 63–83.
- González, Monserrat. 2004. *Pragmatic Markers in Oral Narrative: The Case of English and Catalan*. Amsterdam, Philadelphia: Benjamins.
- Graesser, A. C., M. Singer, and T. Trabasso. 1994. Constructing inferences during narrative text comprehension. *Psychological Review* 101: 371–395.
- Graves, R., and T. Landis. 1985. Hemispheric control of speech expression in aphasia. *Archives of Neurology* 42: 249–251.
- Greene, S. B., G. McKoon, and R. Ratcliff. 1992. Pronoun resolution and discourse models. *Journal of Experimental Psychology: Learning, Memory and Cognition* 18: 266–283.
- Grenoble, Lenore. 2004. Parentheticals in Russian. *Journal of Pragmatics* 36, 11: 1953–1974.
- Griffin, R., O. Friedman, J. E. Ween, E. Winner, F. Happe, and H. Brownell. 2006. Theory of mind and the right cerebral hemisphere: Refining the scope of impairment. *Laterality* 11, 3: 195–225.
- Hagoort, Peter, Colin M. Brown, and Tamara Y. Swaab. 1996. Lexical-semantic event-related potential effects in patients with left hemisphere lesions and aphasia, and patients with right hemisphere lesions without aphasia. *Brain* 119: 627–649.
- Hagoort, Peter, and David Poeppel. 2013. The infrastructure of the language-ready brain. In Michael A. Arbib (ed.), *Language, Music, and the Brain 2013*. Strüngmann Forum Reports, vol. 10, J. Lupp, series ed. Cambridge, MA: MIT Press. Pp. 233–255.

On Some Correlations between Grammar and Brain Lateralization

- Hansen, Maj-Britt Mosegaard. 1998. The semantic status of discourse markers. *Lingua* 104, 3–4: 235–260.
- Happe, F., H. Brownell, and E. Winner. 1999. Acquired “theory of mind” impairments following stroke. *Cognition* 70, 3: 211–240.
- Haselow, Alexander. 2011. Discourse marker and modal particle: The functions of utterance-final *then* in spoken English. *Journal of Pragmatics* 43: 3603–3623.
- Haselow, Alexander. 2013. Arguing for a wide conception of grammar: The case of final particles in spoken discourse. *Folia Linguistica* 47, 2: 375–424.
- Heine, Bernd. 2013. On discourse markers: Grammaticalization, pragmaticalization, or something else? *Linguistics* 51, 6: 1205–1247.
- Heine, Bernd, Tania Kuteva, Gunther Kaltenböck, and Haiping Long. 2013. An outline of Discourse Grammar. In Shannon Bischoff and Carmen Jeny, *Reflections on Functionalism in Linguistics*. Berlin: Mouton de Gruyter. Pp. 175–233.
- Heine, Bernd, Tania Kuteva, and Gunther Kaltenböck. 2014. Discourse Grammar, the dual process model, and brain lateralization: Some correlations. *Language & Cognition* 6, 1: 146–180.
- Hellige, J. B. 1990. Hemispheric asymmetry. *Annual Review of Psychology* 41: 55–80.
- Hellige, J. B. 1993. *Hemispheric Asymmetry: What's Right and What's Left*. Cambridge, MA: Harvard University Press.
- Helmstaedter, C., M. Kurthen, D. B. Linke, and C. E. Elger. 1994. Right hemisphere restitution of language and memory functions in right hemisphere language dominant patients with left temporal lobe epilepsy. *Brain* 117: 729–737.
- Hieda, Osamu. 2014. Independent pronouns and topic shift in Kumam. *Studies in Nilotic Linguistics* 8: 65–102.
- Hird, K., and P. K. Kirsner. 2003. The effect of right cerebral hemisphere damage on collaborative planning in conversation: An analysis of intentional structure. *Clinical Linguistics and Phonetics* 17, 4–5: 309–315.
- Hough, M. 1990. Narrative comprehension in adults with right and left hemisphere brain damage: Theme organization. *Brain and Language* 38: 253–277.
- Howe, Mary Locke. 1991. Topic Change in Conversation. Ph.D. dissertation, Department of Linguistics, University of Kansas.
- Huddleston, R., and G. K. Pullum. 2002. *The Cambridge Grammar of the English Language*. Cambridge: Cambridge University Press.
- Jakobson, Roman. 1980. *Brain and Language*. Columbus, OH: Slavica Publishers.
- Joanette, Y., P. Goulet, and D. Hannequin. 1990. *Right Hemisphere and Verbal Communication*. New York: Springer.
- Joanette, Y., P. Goulet, B. Ska, and J. Nespoulous. 1989. Informative content of narrative discourse in right brain-damaged right-handers. *Brain and Language* 29: 81–105.
- Johns, C. L., K. Tooley, and M. J. Traxler. 2008. Discourse impairments following right hemisphere brain damage: A critical review. *Language and Linguistics Compass* 2, 6: 1038–1062.
- Johnson, Alison. 2002. So ...?: Pragmatic implications of so-prefaced questions in formal police interviews. In J. Cotterill (ed.), *Language in the Legal Process*. New York: Palgrave Macmillan. Pp. 91–110.
- Joseph, Rhawn. 2000. *Neuropsychiatry, Neuropsychology, Clinical Neuroscience*. New York: Academic Press.
- Jucker, Andreas H. 1997. The discourse marker *well* in the history of English. *English Language and Linguistics* 1,

On Some Correlations between Grammar and Brain Lateralization

1: 91–110.

Jung-Beeman, Mark. 2005. Bilateral brain processes for comprehending natural language. *Trends in Cognitive Sciences* 9: 512–518.

Kacinik, N., and Chiarello, Christine. 2003. An investigation of hemisphere differences for moderately imageable words across high and low image contexts. *Brain and Cognition* 53: 239–242.

Kahneman, Daniel. 2012. *Thinking, Fast and Slow*. First published 2011 by Farrar, Straus and Giroux, USA. London: Penguin Books.

Kaltenböck, Gunther, Bernd Heine, and Tania Kuteva. 2011. On thetical grammar. *Studies in Language* 35, 4: 848–893.

Kaplan, J. A., H. H. Brownell, J. R. Jacobs, and H. Gardner. 1990. The effects of right hemisphere damage on the pragmatic interpretation of conversational remarks. *Brain and Language* 38, 2: 315–333.

Karow, C. M., and E. C. Connors. 2003. Affective communication in normal and brain-damaged adults: An overview. *Seminars in Speech and Language* 24, 2: 69–91.

Kasparian, Kristina. 2013. Hemispheric differences in figurative language processing: Contributions of neuroimaging methods and challenges in reconciling current empirical findings. *Journal of Neurolinguistics* 26, 1: 1–21.

Kintsch, W. 1988. The role of knowledge in discourse comprehension: A construction–integration model. *Psychological Review* 95: 163–182.

Knecht, S., M. Deppe, B. Dräger, L. Bobe, H. Lohmann, E.-B. Ringelstein, and H. Henningsen. 2000. Language lateralization in healthy right-handers. *Brain* 123, 1: 74–81.

Kriendler, A., and A. Fradis. 1968. *Performances in Aphasia*. Paris: Gautier-Villars.

Lambrecht, Knud. 1996. On the formal and functional relationship between topics and vocatives: Evidence from French. In Adele E. Goldberg (ed.), *Conceptual Structure, Discourse and Language*. CSLI Publications. Stanford, CA: Center for the Study of Language and Information. Pp. 267–288.

Lehman Blake, M. 2005. Tangential, egocentric, verbose language: Is it right hemisphere brain damage or normal aging? Paper presented at the Clinical Aphasiology Conference. May 31–June 4.

Lehman Blake, M. 2006. Clinical relevance of discourse characteristics after right hemisphere brain damage. *American Journal of Speech-Language Pathology* 15, 3: 255–267.

Lehman Blake, M. 2010. Communication deficits associated with right hemisphere brain damage. In J. S. Damico, N. Muller, and M. J. Ball (eds.), *The Handbook of Language and Speech Disorders*. Chichester, UK: Wiley-Blackwell. Pp. 556–576.

Lenk, Uta. 1998. *Marking Discourse Coherence: Functions of Discourse Markers in Spoken English*. Tübingen: Narr.

Ley, R. G. 1980. Emotion and the Right Hemisphere. Ph.D. Dissertation, University of Waterloo.

Ley, R. G., and M. P. Bryden. 1983. Right hemisphere involvement in imagery and effect. In E. Perecman (ed.), *Cognitive Processing in the Right Hemisphere*. New York: Academic Press. Pp. 111–123.

Lojek-Osiejuk, E. 1996. Knowledge of scripts reflected in discourse of aphasics and right-brain-damaged patients. *Brain and Language* 53: 58–80.

Mackenzie, C., T. Begg, K. R. Lees, and M. Brady. 1997. Right hemisphere stroke: incidence, severity and recovery of language disorders. Stroke Association. Final Report re Grant No 11/93.

Mackenzie, C., and M. Brady. 2008. Communication difficulties following right-hemisphere stroke: Applying

On Some Correlations between Grammar and Brain Lateralization

- evidence to clinical management. *Evidence-Based Communication Assessment and Intervention* 2, 4: 235–247.
- Marini, A. 2012. Characteristics of narrative discourse processing after damage to the right hemisphere. *Seminars in Speech and Language* 33, 1: 68–78.
- Marini, A., S. Andreetta, S. del Tin, and S. Carlomagno. 2011. A multi-level approach to the analysis of narrative language in aphasia. *Aphasiology* 25: 1372–1392.
- Marini, A., S. Carlomagno, C. Caltagirone, and U. Nocentini. 2005. The role played by the RH in the organization of complex textual structures. *Brain and Language* 93: 46–54.
- Maschler, Yael. 1994. Metalinguaging and discourse markers in bilingual conversation. *Language in Society* 23: 325–366.
- McKoon, G., and R. Ratcliff. 1990. Priming in item recognition: The organization of propositions in memory for text. *Journal of Verbal Learning and Verbal Behavior* 19: 369–386.
- McKoon, G., and R. Ratcliff. 1992. Inference during reading. *Psychological Review* 99: 440–466.
- McKoon, G., and R. Ratcliff. 1998. Memory based language processing: Psycholinguistic research in the 1990's. *Annual Review of Psychology* 49: 25–42.
- Menenti, Laura, Katrien Segaert, and Peter Hagoort. 2012. The neuronal infrastructure of speaking. *Brain and Language* 122, 2: 71–80.
- Mitchell, Rachel L. C., and Tim J. Crow. 2005. Right hemisphere language functions and schizophrenia: The forgotten hemisphere? *Brain* 128: 963–978.
- Molloy, R., H. H. Brownell, and H. Gardner. 1990. Discourse comprehension by right-hemisphere stroke patients: Deficits in prediction and revision. In Y. Joanette and H. H. Brownell (eds.), *Discourse Ability and Brain Damage: Theoretical and Empirical Perspectives*. New York: Springer. Pp. 113–130.
- Moscovitch, M. 1983. The linguistic and emotional functions of the normal right hemisphere. In E. Perecman (ed.), *Cognitive Processing in the Right Hemisphere*. New York: Academic Press. Pp. 57–82.
- Myers, P. S. 1978. Analysis of right hemisphere communication deficits: Implications for speech pathology. In R. A. Brookshire (ed.), *Clinical Aphasiology: Proceedings of the Conference*. Minneapolis: BRK Publishers.
- Myers, P. S. 1994. Communication disorders associated with right-hemisphere brain damage. In R. Chapey (ed.), *Language Intervention Strategies in Adult Aphasia*. 3d ed. Baltimore: Williams and Wilkins.
- Myers, P. S. 1999. *Right Hemisphere Damage: Disorders of Communication and Cognition*. London: Singular Publishing Group.
- Myers, P. S. 2001. Communication disorders associated with right hemisphere damage. In R. Chapey (ed.), *Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders*. 4th ed. Baltimore: Lippincott Williams and Wilkins.
- Neininger, Bettina, and Friedemann Pulvermüller. 2003. Word-category specific deficits after lesions in the right hemisphere. *Neuropsychologia* 41: 53–70.
- Newman, Paul. 2000. *The Hausa Language: An Encyclopedic Reference Grammar*. New Haven, London: Yale University Press.
- Norrick, Neal R. 2009. Interjections as pragmatic markers. *Journal of Pragmatics* 41: 866–891.
- O'Connell, Daniel C., and Sabine Kowal. 2005. *Uh* and *um* revisited: Are they interjections for signaling delay? *Journal of Psycholinguistic Research* 34: 555–576.
- Östman, J.-O. 1995. Pragmatic particles twenty years after. In B. Warvik, S. K. Tanskanen, R. Hiltunen (eds.), *Organization in Discourse: Proceedings of the Turkish Conference*. Turku: Anglica Turkuensia. Pp. 95–108.

On Some Correlations between Grammar and Brain Lateralization

- Ozonoff, Sally, and Judith N. Miller. 1996. An exploration of right-hemisphere contributions to the pragmatic impairments of autism. *Brain and Language* 52: 411–436.
- Park, Innhwa. 2010. Marking an impasse: The use of anyway as a sequence-closing device. *Journal of Pragmatics* 42: 3283–3299.
- Pawley, Andrew. 2009. Grammarians' languages versus humanists' languages and the place of speech act formulas in models of linguistic competence. In Roberta Corrigan, Edith A. Moravcsik, Hamid Ouali, and Kathleen M. Wheatley (eds.), *Formulaic Language*. Volume 1: *Distribution and Historical Change*. Typological Studies in Language, 82. Amsterdam, Philadelphia: Benjamins. Pp. 3–26.
- Pittner, Karin. 1995. Zur Syntax von Parenthesen. *Linguistische Berichte* 156: 85–108.
- Prat, Chantel S., Debra L. Long, and Kathleen Baynes. 2007. The representation of discourse in the two hemispheres: An individual differences investigation. *Brain and Language* 100, 3: 283–294.
- Price, Cathy, Guillaume Thierry, and Tim Griffiths. 2006. Speech-specific auditory processing: Where is it? *Trends in Cognitive Sciences* 9, 6: 271–276.
- Prutting, C., and D. Kirchner. 1987. A clinical appraisal of the pragmatic aspects of language. *Journal of Speech and Language Disorders* 52: 105–119.
- Quirk, Randolph, Sidney Greenbaum, Geoffrey Leech, and Jan Svartvik. 1985. *A Comprehensive Grammar of the English Language*. London, New York: Longman.
- Rinaldi, M. C., P. Marangolo, and F. Baldassarri. 2004. Metaphor comprehension in right brain-damaged patients with visuo-verbal and verbal material: A dissociation (re)considered. *Cortex* 40: 479–490.
- Robertson, D. A., M. A. Gernsbacher, S. J. Guidotti, R. R. W. Robertson, W. Irwin, B. J. Mock, et al. 2000. Functional neuroanatomy of the cognitive process of mapping during discourse comprehension. *Psychological Sciences* 11, 3: 255–260.
- Ross, Elliot D., Robin D. Thompson, and Joseph Yeniksky. 1997. Lateralization of affective prosody in brain and the callosal integration of hemispheric language functions. *Brain and Language* 56, 1: 27–54.
- Rota, Giuseppina. 2009. Direct brain feedback and language learning from the gifted. In Gzegorz Dogil and Maria Reiterer (eds.), *Language Talent and Brain Activity*. Berlin: Mouton. Pp. 337–350.
- Sakai, Kuniyoshi L., Yoshinori Tatsuno, Kei Suzuki, Harumi Kimura, and Yasuhiro Ichida. 2005. Sign and speech: A modal commonality in left hemisphere dominance for comprehension of sentences. *Brain* 128, 6: 1407–1417.
- Schiffrin, Deborah. 1987. *Discourse Markers*. Studies in Interactional Sociolinguistics, 5. Cambridge: Cambridge University Press.
- Schourup, Lawrence Clifford. 2011. The discourse marker *now*: A relevance-theoretic approach. *Journal of Pragmatics* 43: 2110–2129.
- Shamay-Tsoory, S. G., R. Tomer, B. D. Berger, and J. Aharon-Peretz. 2003. Characterization of empathy deficits following prefrontal brain damage: The role of the right ventromedial prefrontal cortex. *Journal of Cognitive Neuroscience* 15, 3 (April 1): 324–337.
- Shammi, P., and D. T. Stuss. 1999. Humour appreciation: A role of the right frontal lobe. *Brain* 122 (4): 657–666.
- Sherratt, Sue. 2007. Right brain damage and the verbal expression of emotion: A preliminary investigation. *Aphasiology* 21, 3–4: 320–333.
- Sherratt, Sue, and Karen Bryan. 2012. Discourse production after right brain damage: Gaining a comprehensive picture using a multi-level processing model. *Journal of Neurolinguistics* 25: 213–239.
- Shields, Jane. 1991. Semantic-pragmatic disorder: A right hemisphere syndrome? *British Journal of Disorders of*

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Communication 26: 383–392.

Sidtis, Diana, Gina Canterucci, and Dora Katsnelson. 2009. Effects of neurological damage on production of formulaic language. *Clinical Linguistics and Phonetics* 23, 4: 270–284.

Siegal, Michael, Janet Arrington, and Michael Radel. 1996. Theory of mind and pragmatic understanding following right hemisphere damage. *Brain and Language* 53: 40–50.

Smith, Sara W., and Andreas H. Jucker. 2000. *Actually* and other markers of an apparent discrepancy between propositional attitudes of conversational partners. In Gisle Andersen and Thorstein Fretheim (eds.), *Pragmatic Markers and Propositional Attitude*. Amsterdam, Philadelphia: Benjamins. Pp. 207–237.

Springer, Sally P., and Georg Deutsch. 1983. *Left Brain, Right Brain*. A Series of Books in Psychology. New York: W. H. Freeman.

St George, M., M. Kutas, A. Martinez, and M. I. Sereno. 1999. Semantic integration in reading: Engagement of the RH during discourse processing. *Brain* 122: 1317–1325.

Taglicht, Josef. 2001. *Actually*, there's more to it than meets the eye. *English Language and Linguistics* 5(1): 1–16.

Taylor, Kirsten I., and Marianne Regard. 2003. Language in the right cerebral hemisphere: Contributions from reading studies. *News in Physiological Sciences* 18, 6: 257–261.

Tompkins, C. A. 1995. *Right Hemisphere Communication Disorders: Theory and Management*. San Diego, CA: Singular Publishing Group, Inc.

Tompkins, C. A. 2008. Theoretical considerations for understanding “Understanding” by adults with right hemisphere brain damage. *Perspectives on Neurophysiology and Neurogenic Speech and Language Disorders* 18, 2: 45–54.

Tompkins, C. A. 2012. Rehabilitation for cognitive-communication disorders in right hemisphere brain damage. *Archives of Physical Medicine and Rehabilitation* 93, Suppl. 1: S61–S69.

Tompkins, C. A., W. Fassbinder, M. T. Lehman-Blake, and A. Baumgaertner. 2002. The nature and implications of right hemisphere language disorders: Issues in search of answers. In Argye E. Hillis (ed.), *The Handbook of Adult Language Disorders: Integrating Cognitive Neuropsychology, Neurology, and Rehabilitation*. New York, London, Hove: Psychology Press. Pp. 429–448.

Tottie, Gunnel. 2011. *Uh* and *um* as sociolinguistic markers in British English. *International Journal of Corpus Linguistics* 16: 173–196.

Tottie, Gunnel. 2014. On the use of *uh* and *um* in American English. *Functions of Language* 21: 6–29.

Tottie, Gunnel. 2015. *Uh* and *um* in British and American English: Are they words? Evidence from co-occurrence with pauses. In Rena Torres Cacoullos, Nathalie Dion, and André Lapierre (eds.), *Linguistic Variation: Confronting Fact and Theory*. New York: Routledge.

Tottie, Gunnel, and Sebastian Hoffmann. 2006. Tag questions in British and American English. *Journal of English Linguistics* 34, 4: 283–311.

Tsur, Reuven. 2010. Poetic conventions as cognitive fossils. *Style* 44, 4: 496–523.

Van Lancker, Diana. 1988. Nonpropositional speech: Neurolinguistic studies. In A. Ellis (ed.), *Progress in the Psychology of Language*. Volume 3. London: L. Erlbaum. Pp. 49–118.

Van Lancker, Diana. 1990. The neurology of proverbs. *Behavioral Neurology* 3: 169–187.

Van Lancker, Diana. 1997. Rags to riches: our increasing appreciation of cognitive and communicative abilities of the human right cerebral hemisphere. *Brain and Language* 57: 1–11.

Van Lancker, Diana, and J. L. Cummings. 1999. Expletives: Neurolinguistic and neurobehavioral perspectives on

swearing. *Brain Research Reviews* 31: 83–104.

Van Lancker Sidtis, Diana. 2004. When novel sentences spoken or heard for the first time in the history of the universe are not enough: Toward a dual-process model of language. *International Journal of Language and Communication Disorders* 39, 1: 1–44.

Van Lancker Sidtis, Diana. 2009. Formulaic and novel language in a “dual process” model of language competence: Evidence from surveys, speech samples, and schemata. In Roberta Corrigan, Edith A. Moravcsik, Hamid Ouali, and Kathleen M. Wheatley (eds.), *Formulaic Language. Volume 2: Acquisition, Loss, Psychological Reality, and Functional Explanations*. Typological Studies in Language, 83. Amsterdam, Philadelphia: Benjamins. Pp. 445–470.

Van Lancker Sidtis, Diana. 2012. Formulaic language and language disorders. *Annual Review of Applied Linguistics* 32: 62–80.

Van Lancker Sidtis, Diana, and Whitney A. Postman. 2006. Formulaic expressions in spontaneous speech of left- and right-hemisphere damaged subjects. *Aphasiology* 20, 5: 411–426.

van Putten, Saskia. 2014. Left dislocation and subordination in Avatime (Kwa). In Rik van Gijn, Jeremy Hammond, Dejan Matić, Saska van Putten, and Ana Vilacy Galucio (eds.), *Information Structure and Reference Tracking in Complex Sentences*. Typological Studies in Language, 105. Amsterdam, Philadelphia: Benjamins. Pp. 71–98.

Videsott, Gerda, Bärbel Herrnberger, Klaus Hoenig, Edgar Schilly, Jo Grothe, Werner Wiater, Manfred Spitzer, and Markus Kiefer. 2010. Speaking in multiple languages: Neural correlates of language proficiency in multilingual word production. *Brain & Language* 113: 103–112.

Wager, T. D., K. L. Phan, I. Liberzon, and S. F. Taylor. 2003. Valence, gender, and lateralization of functional brain anatomy in emotion: A meta-analysis of findings from neuroimaging. *NeuroImage* 19: 513–531.

Walker, J. P., T. Daigle, and M. Buzzard. 2002. Hemispheric specialisation in processing prosodic structures: Revisited. *Aphasiology* 16, 12: 1155–1172.

Weylman, S. T., H. H. Brownell, M. Roman, and H. Gardner. 1989. Appreciation of indirect requests by left- but not right-brain-damaged patients: The effects of verbal context and conventionality of wording. *Brain and Language* 36: 580–591.

Wichmann, Ann, Anne-Marie Simon-Vandenberg, and Karin Aijmer. 2010. Of course: How prosody reflects semantic change: a synchronic case study of *of course*. In Hubert Cuyckens, Kristin Davidse, and Lieven Vandelanotte (eds.), *Subjectification, Intersubjectification and Grammaticalization*. Berlin: Mouton. Pp. 103–154.

Winner, E., and H. Gardner. 1977. The comprehension of metaphor in brain-damaged patients. *Brain* 100: 717–723.

Witelson, S. F., and W. Pallie. 1973. Left hemisphere specialization for language in the newborn: Neuroanatomical evidence of asymmetry. *Brain* 96: 641–646.

Wright, Paul, Emmanuel A. Stamatakis, and Lorraine K. Tyler. 2012. Differentiating hemispheric contributions to syntax and semantics in patients with left-hemisphere lesions. *Journal of Neuroscience*, 32, 24 (June 13): 8149–8157.

Notes:

(¹) The technique employed was functional transcranial Doppler-ultrasonography (fTDU). Unlike the study of brain lesions, functional imaging techniques such as fTCD assess brain activation rather than inactivation.

(²) Instead of RHD and LHD, some authors use the terms right brain damage (RBD) and left brain damage (LBD), respectively.

(³) We found no corresponding evidence for deficits with vocatives in persons with RHD.

(4) While aphasia may in rare cases be associated with right hemisphere damage, it is almost exclusively a phenomenon of left hemisphere dysfunction in the distribution of the middle cerebral artery. Extending over most of each hemisphere, this artery excludes a narrow strip on the anterior frontal lobe and another narrow area on the posterior parietal lobe (Van Lancker Sidtis 2009). Accordingly, with the term “aphasic speech” we will refer exclusively to cases of aphasia caused by LH damage.

(5) We are ignoring here a more restricted hypothesis according to which the right hemisphere is dominant only for unpleasant and negative emotions (see Borod et al. 2002; Wager et al. 2003).

(6) While it is unclear what “linguistic prosody” exactly stands for, we assume that what is implied are prosodic features characteristic of Sentence Grammar speech. On the other hand it has also been claimed that both “linguistic” and emotional prosody are managed by subcortical structures, particularly the basal ganglia (Cancelliere and Kertesz 1990; Blonder et al. 1995).

(7) For the contribution of subcortical structures to the production of overlearned linguistic material (e.g., recited speech), see Bridges et al. 2013.

(8) The authors suggest, however, that the semantic network appears to be degenerately organized with regions in both hemispheres able to perform similar computations since right temporal activity did not differ between patients and controls (Wright et al. 2012).

(9) Discourse Grammar thus is restricted to *linguistic* resources, that is, paralinguistic phenomena, such as body movements, are not in its scope. There remain a number of questions, in particular, the following: What justification is there for assigning Sentence Grammar (SG) and Thetical Grammar (TG) to the same general domain, namely Discourse Grammar? Are theticals different enough from SG units to be excluded from the domain of SG? Are theticals similar enough to one another to justify their analysis as a domain of their own? Is the inventory of categories distinguished exhaustive? What is the nature of the boundaries of categories: Are they discrete or gradient? How to identify theticals in isolation? The reader is referred to Heine et al. (2013, section 4.7) for discussion of these questions.

(10) The term “thetical” must not be confused with that of “thetic” statement (see Kaltenböck et al. 2011, note 6).

(11) Not all theticals are positionally flexible; see Heine et al. (2013, section 7) on the distinction between floating and anchored theticals.

(12) Theticals are printed in bold throughout the paper.

(13) For an analysis of all components, see Kaltenböck et al. (2011: 860–864).

(14) The components source of information, discourse setting, and world knowledge are disregarded in the present discussion as they are less commonly involved in thetical use and may correlate with more than one of the three neural functions identified; e.g., reference to discourse setting may be made as an emotional reaction of the speaker (speaker context) or in an attempt to facilitate interaction with the hearer (social context).

(15) An anonymous reviewer rightly points out that there is ellipsis in both Sentence Grammar and Thetical Grammar. But ellipsis in the latter domain, as it can be observed, e.g., in comment clauses (e.g., *I think, you know*) or question tags (*isn't it?*, *doesn't he?*) is restricted to the latter domain of grammar. Assuming that *angry at the delay* in (7) is an instance of an elliptic nonrestrictive relative clause, then we argue that such cases of “ellipsis” are commonly observed in Thetical Grammar but unlikely to occur in Sentence Grammar.

(16) “ICE-GB” stands for the International Corpus of English, British component.

(17) “DCPSE” stands for Diachronic Corpus of Present Day English (<http://www.ucl.ac.uk/english-usage/projects/dcpse/>).

(18) In the framework of Discourse Grammar (Heine et al. 2013), interjections include exclamatives (*what a shame!*) and fillers (*uh, um*).

(19) This semantic description differs in a number of ways from that proposed by other authors (e.g., Schiffrin 1987;

Aijmer and Simon-Vandenbergen 2003; González 2004; Cuenca 2008).

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