# New Impulses in Word-Formation

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# Inhalt

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## 1 Introduction

The past few decades of linguistic research have witnessed not only the emergence of a variety of new theoretical frameworks that have either descended from or arisen in opposition to the framework of generative grammar that had dominated the mainstream of theoretical linguistics up through the early 1990s, but have also been privy to the increasing importance of a number of other linguistic sub-disciplines interacting with and complementing research in theoretical linguistics. The purpose of this volume is to provide illustrative examples of how these new approaches and shifts in emphasis have reshaped the field of morphological analysis in the past few years and, in so doing, have opened up new avenues for gaining more insight into the processes used by speakers of a language in organizing their lexical knowledge and extending its inventory. This special issue entitled *New Impulses in Word-Formation* demonstrates in thirteen individual, empirically oriented case studies how the methods gleaned from newer theoretical models (optimality theory, construction grammar, cognitive grammar, distributive morphology, parallel architecture) as well as from the linguistic sub-disciplines of psycholinguistics, neurolinguistics, corpus linguistics and computational linguistics can be applied lucratively to the field of word-formation. The individual contributions are from a team of international linguists and deal with a broad spectrum of interests divided almost equally between the two major areas of word-formation, derivation and composition.

## 2 Derivation

A central issue in derivation, independent of any theoretical persuasion, is the study of the contrasting forces at work in the emergence and persistence of complex patterns in the lexicon. The forces involved are the productivity of lexical processes on the one hand and the restrictions on the formation of patterns on the other. Word-formation processes are productive to different degrees but all derivational patterns, no matter how productive, are never entirely without constraints. This feature of derivational processes is so pervasive that it serves as a main criterion for distinguishing derivation as the genesis of a new lexical item, or a 'lexeme', from inflection, understood as the use of a lexeme in a modified form. A crucial component of a morphological analysis therefore is a prop-

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er account of these aspects. A second topic in derivation, equally as fundamental, is the nature of derivational processes. Are they primarily predisposed to combine the basic structural units of the lexicon into larger constructions in a synthetic sense similar to the syntactic processes of grammar or are they to be approached paradigmatically, thus releasing the analysis from reliance on the – at times inadequate – notion of 'morpheme' and shifting attention instead to the analytic comparison of whole words? These major concerns are reflected in the contributions to follow.

Heike **Baeskow** begins with a study of the central and non-central patterns of the *-er* suffix in English. She compares the explanatory power of the theoretical framework of generative morphology (GM) with current versions of distributed morphology (DM) that have become known as neo-construction grammar (NCG). Generative approaches express the preference of *-er* for a verbal base directly, i.e., either in a formalized word-formation rule or by postulating a lexical entry for the affix with the appropriate selectional restrictions. This allows them to capture in a direct and perspicuous way the generalizations necessary for predicting the well-formedness of new words in *-er*. The problem generative approaches run into is that by using a morpho-syntactic category to encode the selectional properties of affixes, they often exclude less regular formations as, for instance, denominal *-er* nouns (*jeweler, New Yorker*) or more marginal formations based on adjectives, prepositions, and even phrasal bases (*stranger, upper, empty nester*). Baeskow compares this state of affairs with a possible treatment of her data within NCG. Construction grammar was originally developed with language-specific syntactic constructions in mind, but the notion 'construction' also appealed to proponents of distributed morphology such as Marantz (1997) and Borer (2005) who recast it in a more universal framework that came to be known as 'neo-construction grammar'. The main aim of DM, which was originally based on considerations relating to inflectional morphology, is the attempt to dispense with a lexicon in the generative sense and to distribute its function among the syntactic processes of grammar. It assumes that vocabulary items are either roots that are unspecified for categorical information (√DANCE) or formatives that create categorized syntactic projections. Although the focus of DM is not on word-formation, the general consensus is that affixes, in particular suffixes, fall into the latter category of formatives so that a derivation in *-er* would have the structure $_{n}$[√DANCE [n, *er*]]. That is, it is only by means of merging with a functional node like n that an uncategorized root takes on nominal features. But without an inherent categorization, any abstract root could be nominalized by *-er*. Hence, all *-er* formations – whether deverbal, denominal, deadjectival or based on a preposition or a syntactic phrase – are predicted to have the same status; no further restrictions or generalizations can be formulated in the grammar. Baeskow documents the awareness of neo-constructionists of this problem. Marantz, for instance, assumes that the necessary constraints are mediated by conceptual knowledge. Baeskow documents the weakness of this assumption by pointing to the fact that the members of the relevant cohort of af-

fixes – e.g., the set of nominalizers yielding concrete personal nouns: *-er*, *-ist*, *-ian*, *-eer*, *-ent*/*-ant* – tend to divide up the pool of potential bases by having distinct preferences that are only statable in categorial and structural terms. For example, *-ist* selects non-native verbal bases (*specialist*), while *-er* combines with native verbs; *-ist* allows proper human and abstract common nouns (*Darwinist, deist*), while *-er* never selects proper human nouns. *-ian* prefers proper nouns, both geographical (*African*) and human (*Shakespearian*). *-ent*/*-ant* are like *-ist* in preferring non-native bases, but with the former only intransitive verbs yield an agentive interpretation (*emigrant, convalescent*), while transitive verbs give rise to instrument and patient readings (*defoliant, ingestant*). Furthermore *-ent*/*-ant* do not combine with nouns at all. Because such morpho-syntactic regularities are not expressible in a framework with underspecified abstract roots by appealing only to conceptual knowledge, Baeskow admonishes the framework to be more concerned with word-formation data. If roots lack categorial information in NCG and their combination with suffixes is completely free, the question is how the preference of *-er* for verbal bases is to be explained. GM solves this dilemma by accounting for affixal restrictions in rigid categorial terms, but at the price that the relevant rule blocks other more marginal, but entirely possible, regularities. Baeskow's solution to the dilemma resides in the use of a prototype in derivational processes. The suffix *-er* prototypically selects a category defined in morpho-syntactic terms resulting in a central pattern, but it also allows the features of the prototype to deviate in interaction with lexical, semantic, and conceptual knowledge yielding related but peripheral patterns.

Rochelle **Lieber**'s contribution focuses on the two prominent aspects of derivational processes that were also central to Baeskow's considerations, namely the recalcitrant issue of affixal selection and the deviation of novel formations from a central pattern. In search of a framework in which to express the crucial generalizations, Lieber chooses optimality theory (OT). For Lieber, the selection of a potential base by an affix is not regulated via a morpho-syntactic category as Baeskow assumes, but is a semantic matter and basically gradient in nature. In particular, Lieber is concerned with the three related suffixes *-hood*, *-dom*, and *-ship* that are generally characterized as attaching to concrete nominal bases from which they derive abstract nouns (cf. *sister* > *sisterhood*). However, an extensive study of the neologisms with these affixes in the COCA corpus revealed a number of deadjectival (*foulhood*) and deverbal (*weepdom*) formations as well. Furthermore, the denominal neologisms were not restricted to personal nouns, but also included other semantic classes, cf. *eventhood*, *slothdom*, and *tenureship*. Lieber's objective is to demonstrate how an OT analysis can predict the likelihood with which these suffixes will occur with bases of these various divergent semantic categories. She proposes the following treatment of productively acceptable, but formally marginal neologisms: First, she considers the semantic contribution of the suffixes *-hood*, *-dom*, and *-ship* to their complex words to be identical. This claim is defended against differing views by quoting triplets in context from her corpus that are semantically interchangeable. Sec-

ond, all three suffixes form simple abstract nouns with the meaning 'state, condition of <base>' from bases that denote personal nouns containing, in her lexical semantic framework, the features 'concrete' and 'processual'. The combined semantic formulas of the suffix and base yield a composed skeletal representation that is optimal. Within OT, however, this complex formula is not necessarily obligatory. The well-formedness of a representation actually chosen for a new derivation in *-hood*, *-dom*, or *-ship* depends on the type of violation the deviant representation incurs in comparison with other choices. The representations are evaluated by three faithfulness constraints – of the affix ($F_{Af}$), of the base ($F_B$) as well as a global faithfulness ($F_G$), the latter yielding the compositional combination of base and affix. These three constraints are complemented by a constraint entitled 'Fill Category' (FC) which assumes that it is better to have a word to denote an intended concept than not to have a word. The constraints are ranked such that FC comes after base and affix faithfulness but before the compositionality-guaranteeing global faithfulness. This ranking is the source of possible deviations from the central pattern. Lieber demonstrates how these assumptions account for novel formations found in the corpus: A neologism like *guruhood* fulfills all constraints; the base is a concrete processual noun in Lieber's terms and the derivation itself an abstract noun. Hence, its representation is optimal. *Potatohood*, however, incurs a single violation of $F_G$ since the base, while concrete, is not processual. *Eventhood*, on the other hand, incurs two violations of $F_G$ because its base, while processual, nevertheless reverses the value of the feature 'concrete' from positive to negative. *Truthhood* – felt intuitively to be the most difficult of the three examples – incurs a triple violation of $F_G$ since its base is neither concrete nor processual. All three formations actually found in the corpus are permitted because the violated constraint $F_G$ is ranked below FC: It is better to have a word to express a concept than no word at all. The article goes on to show how closely her assumptions model the ease with which the suffixes combine with different semantic classes of bases as attested in the neologisms of her corpus.

Geert **Booij** applies the framework of construction grammar (CG), or more precisely construction morphology (CM), as Booij terms his approach, to the numerical system of Dutch. He argues that the numerical system encompasses a variety of distinct structural types which, in other theories, would have to be artificially distributed among different components of grammar with no means of relating them to one another in a direct and systematic way. These regularities lend themselves to an enlightening approach, however, in terms of the notion 'construction' or 'schema' A schema is a pairing of form and meaning that is recorded in the lexicon. Booij is able to draw the individual schemas representing the different types of numerical constructions into a coherent cluster of subsystems that interact in a recursive manner, capturing the inherent relatedness and openness of the overall system. The main point is that the notion 'schema' provides the basis for a uniform analysis without having to categorize the constructions involved as either morphological or syntactic and, consequently, cre-

ate an artificial divide among the components of grammar. In his analysis, for instance, there is no embarrassment at having phrases serving as derivational bases (cf. *honderd en der+de* 'hundred and third') or finding compounds conjoined with phrases (*driehonderd en negen-en-negentig* 'three hundred and ninety-nine'). Furthermore, capturing the structure of ordinal numerals by means of a recursive schema expresses very neatly the fact that the ordinal suffix takes scope over the complex number in spite of being associated formally with only the final element. This is accomplished without invoking the notorious bracketing paradox that would result from a generative analysis.

The topic of affixal restrictions is also taken up by Antje **Roßdeutscher** within the theory of distributed morphology (DM). Roßdeutscher is concerned with *-ung* nominalizations that are generally considered to be productive in German. However, she adduces data which demonstrate that the pattern is restricted to certain verb classes determined by the semantic constitution of the base. Pretheoretically, it appears that *-ung* formations are possible with sortal and property-denoting verbs but excluded with verbs denoting a manner of action. As discussed earlier by Baeskow, a framework such as GM would undoubtedly express the distinction in categorical terms, differentiating denominal and deadjectival bases from deverbal ones. In DM this difference cannot be expressed categorically, but only in phrase structural terms. Roßdeutscher chooses to do just this: she annotates Marantz' (2005) phrase structures with semantic information in the notation of discourse representation theory (DRT). Manner-of-action roots (cf. *ein Gericht kochen* 'to cook a dish') appear in mono-eventive structures in which vP dominates a little v head merged with the root. A prepositional phrase is adjoined to vP which is headed by an empty preposition that mediates between the process denoted by the root and the prepositional argument, characterizing the argument as the entity with respect to which the process denoted by the root culminates (i.e., cooking culminates in a dish): [$_{vP}$ [$_{PP}$ [[$_{P}$ Ø] ein Gericht]] [$_{vP}$ [$_{v}$ √KOCH]]]. Sortal and property roots (cf. *den Tisch säubern* 'to clean the table'), on the other hand, are found in bi-eventive configurations in which vP dominates a v and a sister rootP headed by the root merged with its complement: [$_{vP}$ [$_{rootP}$ [$_{comp}$ den Tisch √säuber]] v]. It is this difference that is responsible for the selection by the suffix. In DM terms, the functional nominal head *-ung* merges with a bi-eventive vP, but is incompatible with a mono-eventive root. The derived noun will inherit the internal argument of the verbal root, cf. *die Säuberung des Tisches*. The fact that both the existence of an *-ung* noun and the range of its interpretations are predictable from the ontological category of the root provides evidence that the framework of DM can be profitably implemented in the field of derivational word-formation. As far as the caveats brought up by Baeskow go regarding the choice of nominalizer *-ung* vs. other members of the cohort (*-ion*, *-e*, *-en*, and *-Ø*), Roßdeutscher's answer is that the functional category 'n' is spelled out as the functional listeme *-ung* in the structural environment of a bi-eventive root. This analysis is sure to stimulate further research into whether this feature indeed distinguishes *-ung* forma-

tions from the other event nominalizations and how the postulated compatibility is to be encoded in the theory if listemes are underspecified. At any rate, Roßdeutscher demonstrates how the abstract syntactic structures of DM can be complemented profitably by semantic representations permitting compositional processes of meaning constitution in lexical items.

Andrew **Spencer** discusses various transpositional processes in the lexicon which are responsible for a number of diverse construction types ranging along a scale from canonical derivation to canonical inflection. Deverbal nominalizations in *-ung* fall to the derivational end of the scale by virtue of both changing the morphological category and adding semantic components to the base. Borderline cases towards the middle of the scale include the adjectival use of verbal participles where no new lexeme is created but the syntactic category has changed. Other participial constructions, namely those involving neither a change of category nor of semantic make-up, position themselves at the inflectional end of the scale and can be considered pure transpositions. Spencer sketches the complexity of the problem surrounding transpositions with illustrative examples from a number of languages. Argument alternations such as the passive and applicative seem to be inflectional processes in that they fail to add additional meaning to the underlying verb. Causatives, on the other hand, add a causative meaning component, but it is difficult to say whether this component actually creates a new lexeme. Particularly baffling are the mixed cases in which a word belongs simultaneously to two different categories, a particular morphological category but a different syntactic category. An example would be the adjectival nouns in German of the type *der*/*die Arme* ('poor fellow/woman') which as nouns retain the weak and strong inflections of the adjectival base (*arm* 'poor'). Because standard linguistic terminology falls short of expressing such lexical relatedness appropriately, Spencer works within his own framework of generalized paradigm function morphology (GPFM). GPFM characterizes lexical representations via four functions that map the corresponding attributes of the base lexeme to new values. These four functions are independent of each other and provide Spencer with the descriptive mechanisms he needs to characterize the complex types of lexical relatedness found in his data. For instance, the transposition from a verbal to an adjectival participle involves no change in the function SEM at all. The difference between the German nominalizations *die Erstürmung der Hauptstadt* and *das Erstürmen der Hauptstadt* ('the storming of the capital'), on the other hand, is that the *-ung* nominal has a telic interpretation which entails the addition of the feature BOUNDED to the SEM of the verb. The nominalized infinitive *das Erstürmen* does not involve a change in SEM. Both *die Erstürmung* and *das Erstürmen* entail a change in SYN from a verb to a noun. FORM will allow the Nom-feature of the deverbal nominalizations that add a telic component to their SEM to be spelled out as *-ung*. But the case of the nominalized infinitive is different; here the Nom-feature cannot be realized by means of a simple morpheme – rather, the whole paradigm is based on an inflected form of the verb stem to which further inflectional suffixes can be added, cf. the genitive form *des Erstürmens*. To capture this fact, morpheme-based theories must revert to ex-

ceptional devices, while GPFM can account for the structure by means of referral rules that are needed in the framework independently for inflectional syncretisms. Finally, the LI function decides whether a word form constitutes a new lexeme or merely instantiates the lexeme of the base. In the case of mixed categories the question becomes one of whether a single lexeme can be associated with two different word classes. Spencer argues that they can – an adjectival participle is both an adjective and a verb and, consequently, two distinct FORM representations will share the same LI. Differing from the previous analyses where the morpheme-based approach is clearly discernable – that is, the meaning of a derived word is determined by combining the meaning of the affix with that of the base –, GPFM is a word-based framework. The nominalization function spells out a nominalization feature with various forms (like *-ung*), or it is replaced by a referral rule as in the case of the nominalized infinitive.

An explanatory account of lexical relatedness is also a major aim of Renate **Raffelsiefen**'s in her contribution and leads her – as it did Spencer – to a word-based approach to derivational morphology. Raffelsiefen's concern centers on the semantic relationships that exist synchronically in the vocabulary of English between established affixations and their etymologically related bases. The pervasive semantic regularity to be found in the – highly idiosyncratic and often obsolete – patterns of affixation leads Raffelsiefen to reject the notion that affixes are meaningful units of the vocabulary that combine synthetically with base morphemes to yield a compositional semantics of the complex word. Instead, she adopts the perspective of the language learner who monitors the similarity among the elements of his vocabulary and, when partial phonological sameness in two words is detected, uses it – under the condition of semantic plausibility – to recognize a lexical relationship between the words. To illustrate the proposed strategy of interpretation via base recognition, Raffelsiefen draws attention to word pairs like *normalcy – normal; exactitude – exact; squalor – squalid; contrition – contrite; depth – deep* where the suffixes are morphologically conditioned, i.e. idiosyncratically restricted to certain bases. Nevertheless, the meaning of this cohort of words is in every case the same: 'state/quality/condition of being <adjective>'. This is also the meaning of words ending in the productive suffix *-ness* (*suddenness*). Synonymy of affixes is an unusual phenomenon in grammar: content words shun synonymy. An explanation for it is that affixal units do not play a role in the interpretation of the words; word interpretation is instead a function of the semantics of the base. Evidence for the view is found in the phenomenon of semantic drift. Raffelsiefen documents case after case where a diachronic shift in the meaning of a base correlates with a parallel shift in the meaning of the derived word. The semantic relatedness of the complex word and its base is termed a cohesive relation and results from the awareness that the derivation is dependent on its base. Cohesiveness is relaxed when phonological change blocks the recognition of the base and leads to a dissociation of the members of a cohesive pair. After consideration of a wide range of data, Raffelsiefen formulates in precise phonological and morphological

terms the conditions for the existence of cohesiveness between a base and a derivation. But the real strength of her theory culminates in critical assessment of Riddle's (1985) assumption that the affixes *-ness* and *-ity* differ semantically. Raffelsiefen considers the purported difference (cf. *hyperactivity* and *hyperactiveness*) to be a pragmatic effect: *hyperactiveness* is a rare word and is presumably blocked by the established *hyperactivity*. However, the productivity of *-ness* renders the blocking incomplete. The difference between the established *-ity* and potential *-ness* forms can be explained by considering 'function' nouns like *age* which apply to a scale ranging the full length of the dimension they denote – in this case, from the positive end of the age scale (*old*) to its negative end (*young, new*). The formation *oldness* is a possible word, but one usually blocked by the existence of *age*. If used, however, the meaning of *oldness* would – via base recognition – denote the state of being old, i.e. be restricted in meaning to the positive end of the age scale. *Hyperactivity* shows a similar effect. If *hyperactiveness* is created, this is done in obvious contradistinction to the available *hyperactivity* and hence implies a contrast. The effect is that *hyperactiveness* strongly suggests the presence of the property *hyperactive* to a high degree. Evidence for this lies in contexts that suggest a low degree of the property, cf. "*The remaining boys exhibited ... very low levels of hyperactivity,...*". In this case, *hyperactiveness* – being restricted to the 'high presence' sense – is not a good substitute for *hyperactivity*. The meaning element 'high presence' is not part of the actual semantics of *-ness* but arises via the circumvention of blocking in concert with pragmatic principles. If a *-ness* formation is not subject to blocking, a 'full-scale' reading is possible as the example *thickness* shows: Because of its cohesive relation to *thick*, the 'high-degree' reading is expected, but *thickness of the ice* can also be used when the ice cover is thin, i.e. to express any dimension along the entire scale. Returning to her main theme that affixes are not assigned meaning, Raffelsiefen makes this idea more precise since certain affixes obviously do carry meaning, cf. *greenish* "somewhat green", *tallish* "somewhat tall", etc. Her hypothesis is that the attribution of meaning to particular affixes presupposes optionality. *Green* is a meaningful unit, hence *greenish* can be optionally chosen to communicate more content than just 'green'. In *garish*, *lavish*, and *raffish*, this is not the case. In these latter cases, *-ish* has no meaning, because the units *gar*, etc. cannot stand independently of the whole; there is no optionality involved. The same situation obtains with the initial cohort of nominalizing suffixes whose domains are distinct. Since they are fossilized with particular bases, there is no choice involved in their use. Even the productive suffix *-ness* cannot be said to involve choice since it, as the only productive option, is chosen when the other suffixes are not applicable. This is the source of both affixal synonymy and also the blocking effect. In sum, the operating principle in the construction of meaning is base recognition on the basis of paradigmatic relations between whole words. Fossilized forms are listed in the lexicon as complete words, only productive affixes are encoded in word-formation rules.

## 3 Composition

In the study of compounds, attention is usually centered on the question of compositionality of meaning. The challenge is not to characterize the restrictions on the individual patterns of combinations, but to show whether and how the whole-word meaning can be predicted on the basis of the meaning of the constituents. Frequent abstract relations that facilitate a collocation of words, such as location, purpose, material composition, or the like, as well as relational heads will give rise to semantic clusters which can even be based on a specific first or second constituent yielding a pattern; but such patterns, defined by the relevant implicit meaning component, are of a different nature from the formally restricted derivational patterns. One issue that is equally relevant to derivation and composition, however, is the question of how complex words are stored and accessed. Irregular or non-transparent combinations must, of course, be accessed as whole words, and novel combinations can only be accessed via their constituents, but what about established compounds that are nevertheless regular and semantically transparent? Are they decomposed into their component parts or accessed as whole words, and what precise conditions induce these different modes of access? These are the major issues reflected in the contributions to follow.

Pius **ten Hacken** opens the section on compounding with a study of synthetic and exocentric compounds that are modeled in the framework of Jackendoff's (2002) parallel architecture (PA). Looking first at synthetic compounds, ten Hacken observes two types of constructions. The type *image converter* and *hand-painted*, also referred to as verbal compounds, are assigned the structure in (1a) below, where the first constituent satisfies a position in the argument structure of the deverbal nominal or adjectival head. The type *open-minded* and *four-poster* which contain an adjective + noun or a numeral + noun combination that undergoes affixation, are accorded the structure in (1b). These structures are intended to provide a straightforward basis for the different semantic interpretations, e.g., 'a converter of images', on the one hand, and 'having an open mind', on the other. The drawback of the analysis, however, is that the status of the category α in the second type is not clear since the relevant Num + N constructions cannot be considered normal syntactic phrases and are also not usual compounds (cf. **four post*). In contrast to the synthetic compounds, exocentric compounds are based on underived nominal heads that do not provide the actual referent of the construction, cf. *cottontail*, *paperback*, and *loudmouth*. English also displays the type *turnkey* 'jailor' which is a productive pattern in the Romance languages that do not have synthetic compounds of the formal type *image converter*. An Italian example is *accalappiacanu* 'catch dog' which would be rendered by the more productive verbal compound in English, cf. *dog catcher*. Ten Hacken's goal is to unify the two apparently diverse types into a coherent analysis. First, there is a verbal type (cf. (1a): *image converter, land reform*) which results in an exocentric meaning when the verb occurs without an affix and in first position (cf. (1c): *breakwater*). Secondly, there is a nonverbal type (cf. (1b): *four*

*poster*) which – again when occurring without an affix – results in an exocentric meaning (cf. (1c): *cotton tail*):

(1) a. $[X\ [V\ (Af)]_{N/A}]_{N/A}$ image converter, land reform
b. $[[X\ Y]_{\alpha}\ Af]_{N/A}$ open-minded, four poster
c. $[[X\ Y]_{\alpha}\ ]_{N/A}$ breakwater, cotton tail

Modelling these considerations within the framework of PA triggers a discussion of two interesting theoretical points. The first concerns the nature of the affix *-er* in (1a) which ten Hacken views as meaningless. In PA, lexical units are three-way correspondences of phonological, syntactic, and semantic chunks of information. Hence, the affix in (1a) will be coindexed with the corresponding phonological information in its position within the word structure, but it will not be coindexed with independent semantic content, ensuring that it does not have a meaning of its own but only as part of the noun it creates. This is a paradigmatic (in contrast to a morpheme-based or syntagmatic) analysis similiar in spirit to those proposed by Spencer and Raffelsiefen. A second theoretical point is brought to light by the problematic nature of the first constituent α in the structures of (1b) and (1c). Since the combination labeled α cannot be inserted into a syntactic structure, ten Hacken classifies it as a morphological phrase. Contemplating the difference between word structures and the other phonology-semantics-syntax correspondences in the lexicon that determine the syntactic structures of the grammar, ten Hacken argues for the need for an additional component of word-formation rules that is separate from the lexicon proper which, in PA, contains the completely productive rules of the grammar, on the one hand, and the lexical redundancy statements on the other. The function of word-formation rules cannot be derived from the lexical redundancy rules – they serve the purpose of creating new lexical items. With a separate word-formation component in place, it is possible to restrict the distribution of the morphological phrase α to serve as a base for conversion (*cotton tail*) or affixation (*four poster*).

Sebastian **Bücking**'s concern with compounds begins with the assumption that ended ten Hacken's article, i.e., that there is a principled difference between compounds and syntactic structures. Syntactic structures function as descriptions, while compounds are created with the intention of naming complex concepts. Focusing on A+N and V+N compounds, Bücking formulates a general modification template that – in addition to conjoining the predicates denoted by the modifier and the head constituents – introduces an underspecified relation variable R into the interpretation to mediate between the two. If the modification occurs at the syntactic level, R is instantiated as the identity function; when applying at the lexical level, R is instantiated as an integral relation ($R_{INTEGRAL}$) that is further specified by contextual or world knowledge via abductive reasoning. Hence, the template assigns related but different interpretations to a compound and a phrase. When instantiated as the identity function, the variable R guarantees the intersective reading of AP+N (*blauer Tee*: 'an entity that is both blue and tea'). When $R_{INTEGRAL}$ is implemented, R picks out an integral part of the head

concept in a A+N compound to which it conjoins the predicate of the modifier (*Blautee*: 'an entity that is tea and an integral constituent of which is blue'). The analysis is substantiated by different tests. The test of incompatible attribution, for example, yields meanings that are intelligible in compounds but not in phrases, cf.: *roter Blautee* but **roter blauer Tee*. In compounds, the template ascribes the predicates 'red' and 'blue' to different entities: 'red' applies to 'tea' while 'blue' applies to some integral part of 'tea', so there is no conflict between the two modifiers as there is in the case of phrases where the template identifies the entities carrying the properties 'tea', 'red', and 'blue'. Bücking's analysis captures the intuition that the lexical and phrasal combinations *Blautee* and *blauer Tee* are nearly synonymous out of context, but in context their meanings can be teased apart. Importantly, the variable $R_{INTEGRAL}$ in the modification template of compounds guarantees a certain amount of flexibility in the choice of an implicit relation mediating between the constituent concepts, but at the same time its range is limited to an integral dependency between them. These properties render compounds especially felicitous structures for naming in contrast to describing novel categories: two predicates not directly related to one another are integrated into a coherent semantic relation via an underspecified integrity relation. The coherence condition reflects the fact that names pick out well-formed classes within homogeneous ontological domains. In fact, Bücking argues that compounds are predisposed to denote 'kinds' and tests this hypothesis by, among other tests, contrasting novel A+N compounds with AP+N phrases in combinations with predicates that select kind terms. He finds a clear difference beween ?*Der Blauhund ist ausgestorben* and ??*Der blaue Hund ist ausgestorben*.

Thomas **Spalding** and his co-authors focus on the conceptual interpretation of compounds within a psycholinguistic framework. In experimental work done in 1997, Gagné and Shoben detected an asymmetry between the influence of modifier and the head in determining a plausible relation for a novel complex concept. Their CARIN theory (Competition Among Relations in Nominals) assumed that relations used with a modifier were stored with the modifier (cf., *mountain stream* 'located_at' and *mountain journal* 'theme_of'). Upon hearing a novel compound with a particular modifier, the relations associated with that modifier become active and compete with one another. The relation chosen to complete the interpretation of the compound is the one that best complies with the meaning of the head noun. Thus, the modifier and head of a compound have different functions: the role of the head is to evaluate the relations suggested by the modifier. The purpose of the present contribution is to present and motivate a modification of the original CARIN theory. The reason for this is that the authors have uncovered evidence attesting to the influence of relations associated with the head. When the meaning of the head is active in a context, it also suggests possible relations for the interpretation of the compound. Therefore, the relational meaning used in interpreting a compound is not limited to the modifier but can also be associated with the head. This discovery results from the use of a different experimental task. In earlier experiments a sense/nonsense task was

employed in which the participants saw a prime in which one of the constituents was identical to its counterpart in the target and the prime had either the same or a different relation from the target. After viewing the prime, participants were asked to judge whether the target compound made sense. A priming effect for the relation was found only when the modifier was the same in prime and target. Furthermore, it took more time to judge the target when the modifier was associated with a number of relations than when it had only one strong relation: the different relations compete with one another as they are being evaluated as to their compatibility with the meaning of the head. The stronger the competition between the relations, the harder it is to make a sense judgment which is reflected in reaction time (RT). This so-called relation strength of the modifier was a better predictor of RT than the frequency of the relation chosen. However, the use of a task in which the relation is already provided (the so-called relation verification task), and hence available to the participant who must simply affirm its plausibility, shows that information about head relations is also available. In the verification tasks, the largest amount of relational priming occurred when the head was the repeated constituent. To account for these results, the CARIN theory is modified to become the Relational Interpretation Competitive Evaluation theory (RICE). The difference is that in RICE both constituents store and activate relational information. Multiple relations compete and are evaluated in a parallel process that rules out implausible fits. This step is followed by a process of elaboration in which the relational interpretation is enriched with further conceptual information not literally part of the involved concepts and the relation connecting them but necessary for understanding the complex concept. Importantly, RICE, as CARIN before it, differs from theories of concept combination in which concepts are represented by schemas consisting of features and relations. In a schema-based theory, when two concepts combine, the modifier concept fills one of the slots in the schema of the head concept, altering the nature of the head. Spalding et al. argue that such theories cannot account for the modifier-based effects they find.

Gary **Libben** is also concerned with the question as to how the composite meaning of a compound arises on the basis of the meaning of its constituents, and – like Spalding and his co-authors – Libben also works within a psycholinguistic framework. Libben's focus, however, is on the actual representation of lexical information in the mental lexicon. His claim is that, as a result of a process he terms 'morphological transcendence', a constituent of a compound and its freely occurring counterpart are not the same lexical element but constitute separate, although related, entries in the mental lexicon. The different environments in which they are encountered during the process of comprehension causes a rift in their status as a single lexeme. This rift ensues because a lexical item as a constituent of a compound typically undergoes a semantic reduction vis-à-vis its free form. Morphological transcendence refers to the process by which new representations develop from independent words, resulting in the establishment of a separate lexical identity for a constituent form. By distinguishing

the constituent form from its free variant, the lexical system rallies to avoid ambiguity and hence to ensure efficiency of processing. When accessing the compound *blackboard*, for example, the words *black* and *board* are not retrieved but rather the constituent forms *black-* and *-board*. Although noun-noun compounding is highly productive in English and seems to be fairly free of restrictions, Libben views the compounding process as one of substituting a word for another in an established pattern (or family) of compounds rather than one of free combination. As a result of the substitution process, constituent lexemes are positionally bound. Therefore the *board-* in *board room* is different from *-board* in *blackboard*. Libben points out that this might be the reason why Spalding, Gagné, Shoben, and their collaborators have consistently found certain semantic roles associated with particular modifier or head patterns in their research. The reason for the presence of a force like morphological transcendence among the processes that shape the architecture of the mental lexicon is to be found in Libben's Principle of Maximization of Opportunity. Libben rejects the idea that economy is a factor guiding the nature of lexical processes. Since the purpose of the lexical processing system is to arrive at meaning as efficiently and quickly as possible, both as much computation and as much storage as is expedient for this purpose will be employed. Maximization of Opportunity ensures that all possible representations that can possibly assist in finding the meaning of a complex form will be activated. Thus, Maximization of Opportunity results in the activation of the whole word as well as the simultaneous decomposition of a complex form into its parts. However, if a complex form – even an opaque form – is automatically decomposed when processed, the parsing of a compound will result in a mismatch between the whole-word meaning and the meaning of its constituents, cf. *board* with *blackboard*. This leads to a situation that is detrimental to the goal of efficient language comprehension and is where the notion of morphological transcendence finds its justification. Morphological transcendence predicts a separate entry *-board* that will resolve the mismatch. The separate form solves the conflict and also predisposes the organization of compounds into positional families with identical modifier or head constituents. In Libben's concept of the mental lexicon, a complex compound like *key-board-room* is not only structurally but also semantically ambiguous. In *keyboard room* the constituent form *-board* is accessed; in *key board-room* it is the form *board-* that is processed.

Carlo **Semenza** and Sara **Mondini** report on the benefits of the application of the methods of neuroscience to study of compounding and on how neuropsychology interacts with and complements the findings of experimental work done in psycholinguistics. The latter taps best into language comprehension using measures like reaction time, as Spalding et al. have demonstrated in this volume. Neuroscience, on the other hand, obtains good results from language production especially from brain-damaged patients. Within the last 20 years neuropsychology has converged on interesting findings about the representation and processing of compounds. First, the so-called 'compound effect' indicates that knowledge of morphological structure and of phonological form is stored separately in

the brain. Patients retain knowledge about the structure of target words, even if the retrieval of their phonological form is impaired. In picture naming tasks, for example, simple and compound words are not mixed. If a simple word is to be named, it may be substituted by another simple word, and if a compound is to be named, patients may produce a compound neologism but do not use a simple word. This effect is stable even with opaque compound targets. Furthermore, the morphological form of the word structure is spared in retrieval errors and, hence, must be independent of the phonological content: a noun-noun target results in a noun-noun paraphasia and a verb-noun target in a verb-noun paraphasia. The constituent that is correctly recalled will also retain its original position in the structure. Neuropsychological evidence also speaks in favor of the decompositional representation of compounds (cf. Libben's Maximization of Opportunity). Not only do substitution errors respect the morphological structure of a target compound, but if only one component of a compound is produced, there are usually prosodic indications of the missing constituent. Misordering errors (*box post* for *post box*) are a further indication of a decomposed storage because they presuppose two structural slots and also because parts of simplex words are never substituted for or rearranged in this way. Furthermore, the fact that both constituents of a compound are available indicates that they are activated in parallel. It appears that one entry activates two separate forms, but a deficit can arise in the association of the semantic components with their position in the bilexemic structure. A further question that presents itself is how the meanings of the components are associated with the whole word. Often a substitution of one constituent seems to be influenced by the whole-word meaning as in the Italian paraphasia *pescetigre* 'fish tiger' for *pescecane* 'shark', where the choice of *tigre* instead of *cane* as a second constituent complies with the aggressive nature of the whole-word meaning. As often in linguistic research, evidence is not always unambiguous, however. Two agrammatic Italian patients studied by Mondini et al. (2002) were able to correctly produce the inflection in adjective-noun compounds but not in adjective-noun phrases. This finding seems to speak for the whole-word processing of these compounds vs. the phrases. On the other hand, Mondini et al. (2005) found that agrammatic Italian patients had trouble retrieving the opaque linking preposition in prepositional compounds, cf. *film a colori* 'color movie' vs. *film in bianco e nero* 'black and white movie'. From this, the authors conclude that access to these compounds involves accessing a single conceptual representation which in turn (in accordance with Libben's Maximization of Opportunity) activates a form corresponding to the whole word as well as activating the three individual components. The higher frequency of the components suppresses the whole form which forces the decomposition route. Decomposition, however, entails accessing a function word in this case (the preposition); function words are generally difficult for agrammatics to process. A final argument for decomposition was found by Koester et al. (2004) who tested gender agreement between an article and the first and second constituent of German compounds. Since the head in German compounds is on the

right, the initial constituent should not influence the choice of article. However, an incongruent article resulted in a left anterior negativity (LAN) in both cases. Such effects can only arise if the first constituent is accessed on its own.

Ingo **Plag** and Gero **Kunter** use statistical analyses conducted on their own corpus of noun-noun compounds to tease apart the factors involved in stress assignment to English compounds. Stress in English compounds is generally found on the first constituent, but because a large number of right-stressed compounds occur as well, the authors reject a rigid rule-based account of stress placement (such as Chomsky and Halle's (1968) Compound Stress Rule) and opt instead for an account of stress variation in terms of the analogical influence of existing patterns in the mental lexicon. In this context they take a critical look at Bell's (2008) hypothesis of a constituent family bias in which the position of stress is negatively correlated with the size of a constituent family. The reason for such a bias might be found in the consideration that a constituent belonging to a large constituent family is usually less informative than a constituent that belongs to a small constituent family. Since stress is normally placed on an informative element in a construction, large constituent families would discourage stress placement. Plag and Kunter find the effect of the constituent family bias to be only a weak indicator of stress placement. Because its effect is small, the authors conclude that family size alone is not a good indication of compound stress and undertake a further analysis of their data which factors in other influences known to affect stress placement to see whether family size under these conditions still plays a role. They find that it does not: there is no significant effect for family size once other factors are considered. One of these other factors is a constituent family stress bias (i.e., the bias a left or right constituent family has toward a left or right stress pattern). The effect of the constituent family stress bias is stronger than that of the constituent family size bias, especially with larger family sizes. The authors acknowledge that their calculations are made on the basis of the small family sizes in their corpus and present for further research the question of whether the effects of family bias might be more pronounced in a model with larger family sizes, like those that are presumably available in speakers' mental lexicons.

Using graph theory and new computational measures of lexical processing, Harald **Baayen** shows that compound constituents display a similar acyclicity (i.e. preference for a specific relative ordering of constituents) to affixes in prefixal and suffixal derivations in English. In compounds this cannot be due to selectional restrictions nor to phonological boundary strength, which Baayen considers even problematic as an explanation for affixal ordering. Acyclicity is apparently motivated independently of considerations of processing complexity and, therefore, must offer processing advantages other than easier parsibility. The data suggest more precisely, however, that rather than acyclicity, it is the extensive connectivity of a constituent that must somehow be difficult to process; i.e., constituents with large secondary family sizes slow down lexical processing. When a compound is accessed, all information about each constituent

as well as their co-constituents (= secondary family size) is activated. This large amount of co-activation together with the need to separate semantically relevant information from all semantically irrelevant information in the extraction of meaning has an inhibitory effect on processing. Like Plag and Kunter, Baayen also stresses the need for further research to backup these exploratory results.

## 4 Summary

The results summarized briefly above, presented in context and fleshed out in more detail in the following contributions, all testify to the profitability of both viewing long-recognized problems under the perspective of new theoretical approaches as well as recasting them into a form that can be treated with the methodology of neighboring disciplines. In each case we find genuine progress in a forward moving field of inquiry that welcomes the chance to open up its borders for interdisciplinary discourse.

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