Conceptual blending, relevance and novel N+N-compounds

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1. Introduction

Conceptual blending theory promises insights into "the general mental capacity of blending" and the human ability "to invent new concepts and to assemble new and dynamic mental patterns" (Fauconnier and Turner 2002: v). It is a general theory of online conceptual combination, applicable to a wide range of areas including "art, science, religion, culture, sophisticated tools, and language" (Fauconnier and Turner 2002: v). The process of conceptual blending projects selected conceptual material from two or more mental spaces into a new *blended* space and merges it, thus reducing the conceptual complexity of the input and turning it into one holistically experienced conceptual gestalt. Alongside this effect of *compression*, another cornerstone of blending theory is the idea that blending tends to result in "emergent structure" (cf. e.g. Fauconnier and Turner 2002: 42–46; Fauconnier 2005). This means that conceptual content that is not available in the input spaces is generated during the blending process.

In principle, emergent structure is open-ended: it is up to the individual 'running the blend' at which point the generation of new information will stop. This has prompted justified criticism that 'anything goes' in blending theory (cf., e.g. Gibbs 2000; Broccias 2004; cf. Fauconnier 2005), an objection that Fauconnier and Turner (2002) countered by introducing a set of *governing* or *optimality principles*, among them topology, integration, unpacking, and relevance, which constrain the blending process and the likely amount of emergent structure resulting from it. The governing principles also include the maximization as well as the intensification of so-called *vital relations* such as SIMILARITY, IDENTITY, CAUSE-EFFECT, PART-WHOLE, TIME, and SPACE.

In its present state conceptual blending theory is sufficiently detailed to allow for fairly reliable predictions of how humans will deal with situations forcing them to combine familiar but previously unrelated concepts in one novel concept. The aim of this paper is to test the predictive power of the

theory against available experimental data on the understanding of novel N+N-compounds.[1] It will emerge that while the principles of relevance and the maximization and intensification of vital relations can indeed explain large sections of this data, there seems to be scope for improvement in conceptual blending theory.

Novel N+N-compounds are attractive test cases for blending theory for at least two reasons. Firstly, since no more than two concepts are explicitly encoded on the linguistic surface, N+N-compounds (just like Adj+N-compounds; see Tribushinina, this volume) are arguably the smallest-sized linguistic triggers of conceptual combination available and thus not subject to interference from other factors, which can never be ruled out when studying full sentences or even longer stretches of discourse. In a manner of speaking, the process of conceptual blending can be studied in its most untainted form here. And secondly, unlike so-called "verbal-nexus compounds" (Marchand 1969: 31–39 such as V-*ing*+N, N+V-*er* or N+V-*ing* forms (e.g. *washing-machine*, *dish-washer*, *speed-dating*), N+N-compounds do not explicitly encode the relation between their two constituents. For example, while it is clear that a *washing-machine* is 'a machine that washes sth (esp. clothes)', the link between *telephone* and *number* is much less specifically determined by the morphological surface form of the compound *telephone number*. While for established compounds like *telephone number* the link has been institutionalized by convention, this is clearly not the case for novel compounds. As a result, when hearers construe interpretations of compounds previously unknown to them, they are forced to come up with some kind of link, and this will often give rise to emergent structure as predicted by blending theory. N+N-compounds thus more or less automatically yield emergent structure revealing central aspects of what goes on during the process of conceptual combination.

2. English N+N-compounds: A brief review of previous research

2.1. Linguistic approaches

English N+N-compounds have been investigated from a large number of different angles. A wide-ranging survey of research published before 1993 can be found in Ryder (1994: 8–46), so I do not have to go into details in that area. Classic studies stemming from early transformational grammar include Lees (1970), Brekle (1970), and Levi (1978). Influential work in

the flourishing European word-formation tradition was presented in the early textbooks by Marchand (1969: 60–63), Adams (1973: 57–89) as well as Bauer (1983: 202–204). Warren (1978) proposed the most fine-grained classification of semantic relations of compounds and discussed pragmatic aspects dealt with earlier by Zimmer (1971) and Downing (1977). Novak (1996) is a volume-sized study of English N+N-compounds focusing, among other things, on their textual functions.

Downing's (1977) study marks an important milestone, as it represents the first major attempt to experimentally investigate processes going on in hearers' minds when confronted with N+N-compounds previously unknown to them. Downing's work served as a methodological model not only for Ryder's (1994) substantial study set in the framework of Cognitive Grammar but more or less directly also for the considerable body of recent psycholinguistic explorations of how novel N+N-compounds are processed. It is on these studies that I will focus since, together with Ryder's work discussed in greater detail below in Section 2.3, they provide the backdrop for the present study.

2.2. Psycholinguistic approaches

Psycholinguists have focused their attention on the determinants governing the comprehension of novel N+N-compounds. A survey of the major positions is provided in Figure 1. As the figure indicates, the approaches differ first of all with regard to the role attributed to pragmatic aspects of compound processing. While the majority of researchers do not forget to stress the importance of pragmatic aspects related to the contextual and cotextual circumstances surrounding the use of novel compounds, they struggle with operationalizing these in their experimental designs. One exception is Dunbar (2005), who studies the increasing institutionalization of novel compounds including the constituent *Goldilocks*, e.g. *Goldilocks economy, Goldilocks scenario, Goldilocks growth* in issues of the *Wall Street Journal* and *The Financial Times* published between January 1991 and July 1998. Dunbar argues that these expressions "will not be interpretable by an intelligent reader in isolation" (2005: 223), stresses the importance of contextual support and argues, very much along the lines suggested by Relevance Theory (Sperber and Wilson 1995; see below Section 3.3), for a speaker-centred approach focusing on the idea that speakers anticipate addressees' current knowledge.

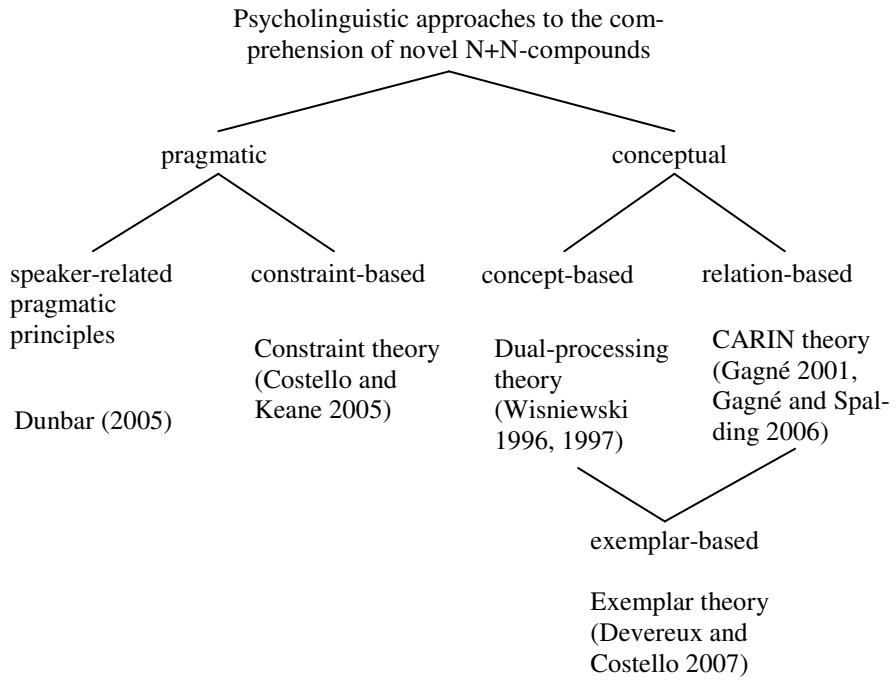

Figure 1. Novel N+N-compounds: Survey of psycholinguistic approaches

Developing out of concept-based approaches (cf. Costello and Keane 2000, 2001) but more strongly relying on pragmatic considerations, Costello and Keane's (2005) constraint theory straddles the boundary between the two major branches in Figure 1. For the two researchers the understanding of novel N+N-compounds is determined by three fairly general pragmatic constraints: *plausibility*, *diagnosticity*, and *informativeness*. The *plausibility* constraint captures the hearer's assumption that a novel compound produced by a speaker is likely to have a referent the hearer is already more or less familiar with.

> This requirement is justified by the pragmatic assumption that the speaker who produced the phrase intends to refer to something that the listener can reconstruct easily (otherwise the speaker would not have used a compound phrase to refer to this thing). (Costello and Keane 2005: 211)

Like this constraint, the idea of *diagnosticity* is based on considerations of optimal relevance prominent in Relevance Theory (not mentioned by Costello and Keane), but it also builds on the notion of *cue validity* familiar to cognitive linguists from prototype theory. The diagnosticity constraint sti-

pulates that the intended concept is 'best' encoded by the two constituents, in the sense that they highlight salient and 'telling' aspects for attention. For example, intending to refer to a man wearing an angel's costume with normal trousers showing underneath, *angelman* would clearly be more diagnostic than *trousersman*, since many more men wear trousers than do angel's costumes. *Angelman* is not only more diagnostic than *trousersman*, but it also fares better with regard to *informativeness*, since the fact that the person has dressed up in angel's costume is clearly more spectacular and thus newsworthy than his wearing trousers.

Conceptual approaches can be divided into concept-based and relation-based ones, depending on where they see the major source of information determining the ease and speed of comprehension of novel N+N-compounds. Typical representatives of concept-based models are Murphy's (1988) Schema Modification Theory and Wisniewski's (1996, 1997) dual-processing theory. Concept-based models tend to work with prototypes or, more often, schemas of the combined concepts representing structural information on their internal feature/attribute composition as well as internal relations. Wisniewski (1997) distinguishes three types of N+N-combinations, viz. relational, property and hybrid ones. For relational compounds, he argues for a process – highly reminiscent of single-scope conceptual blending (see Section 3.1 below) – by which one of the concepts fills and/or substantiates a slot in the schema or scenario triggered by the other. The interpretations of the other two types of compounds are constructed by means of a sequence of two processes (hence the term *dual-processing theory*): first, information from the two concepts is compared and aligned in order to identify elements that can be transferred; and second, transferred properties are re-constructed to be consistent with the concept providing the conceptual structure of the compound (usually the second, i.e. head, constituent).

The most prominent and recent representative of relation-based approaches is the competition-among-relations-in-nominals (short CARIN) theory proposed by Gagné in various publications (e.g. Gagné and Shoben 1997; Gagné 2001; Gagné and Spalding 2006).

> This theory is based on the claim that that one aspect of world knowledge that is particularly relevant to conceptual combination is relational information about how objects, people, and so on interact. (Gagné and Spalding 2006: 151).

More specifically, the familiarity of the addressee, or subject in an experimental task for that matter, with the conceptual relations connecting the

two constituents is seen as one crucial determinant of ease and speed of understanding. The relations tested in Gagné's experiments are couched in fairly general terms and include Head FOR/ABOUT/IN/MADE OF/DURING/CAUSED BY/USES/MAKES/DERIVED FROM Modifier as well as Modifier CAUSES Head, and Modifier HAS Head (cf. Gagné and Shoben 1997: 86). According to Gagné (2001; see also Gagné and Spalding 2006: 152), and perhaps counter to expectation, the the kind of relation established in a given compound is mainly determined by the first, i.e. the modifier, constituent in a compound – a finding which is in stark contrast to the reliance on the schema of the head constituent emphasized by concept-based approaches.

Recently, Devereux and Costello (2007) have suggested an exemplar-based (rather than concept-/prototype-/schema-based) model which allows them to incorporate elements of the relation-based approach and is thus presented as a potential bridge between the competing camps (2007: 96). That concept-based and relation-based approaches do not seem to be incompatible is in fact not all that suprising, since the conceptual relations within compounds largely hinge upon the nature of the concepts themselves. For example, Gagné and Spalding (2006: 152–156) argue that a spatial concept like MOUNTAIN (in e.g. *mountain bird*) will suggest a locative relation, while the substance concept CHOCOLATE will most likely trigger the activation of a MADE OF relation.

2.3. Ryder (1994)

Whereas psycholinguists typically use time-related measures like response latency in priming, lexical decision or familiarity rating tasks, Ryder (1994) opted for the somewhat softer context-free interpretation tasks applied earlier by Downing (1977).[2] Ryder instructed her subjects, who had to explain the meanings of novel compounds presented to them in isolation, to be as specific as possible in their definitions and to try to use the two constituents when explaining the concept the compound evoked (1994: 103). Her study is a particularly rich and valuable source for secondary investigations testing other theoretical frameworks, since her book contains a 100-page appendix painstakingly documenting as many as 4000 responses produced by her informants.[3]

Ryder's hypotheses rest on a schema-building process typical of the Cognitive Grammar framework (cf. Langacker 1987), which is supple-

mented by insights from the version of connectionism dominant at that time called Parallel Distribution Processing (Rumelhart et al. 1986). Her assumption was that schemas are generated by informants in context-free interpretation tasks on the basis of extant individual lexemes including the same components (i.e. by means of exemplar-based analogy) and/or on the basis of linguistic templates abstracted from sets of similar lexemes (pattern-based analogy). In the absence of a context guiding the search for plausible interpretations, informants will construct what Ryder calls *semantic information schemas* on the basis of their familiarity with model lexemes, linguistic templates and their extra-linguistic world knowledge.

Ryder's composed test stimuli were based on 11 linguistic templates in such a way that they differed systematically from good to less probable to improbable with regard to their match with these templates. The linguistic templates were the following:

1. X + LOCATION = location where X is found
2. LOCATION + X = an X found at location
3. X + CONTAINER = container that contains X/where X is stored
4. CONTAINER + X = X normally found or kept in container
5. CONTAINER + X = X shaped like container
6. X + *man* = man who works with/processes/produces X
   - Animal + *man* = man who raises/tends animal
   - Vehicle + *man* = man who drives/operates vehicle
   - Weapon + *man* = man who uses weapon professionally
   - Product + *man* = man who sells/makes/transports product
7. $Animal_1$ + $Animal_2$ = $animal_2$ eats/hunts $animal_1$
8. $Animal_1$ + $Animal_2$ = $animal_2$ like $animal_1$
9. Body Part + Clothing = clothing worn on /reaches to body part
10. Body Part + Non-Clothing = non-clothing used on or operated by Body Part
11. No predetermined linguistic template (randomly chosen compounds)

Ryder's expectations were as follows:

> If the two element nouns in a compound share a semantic information schema that conforms to the linguistic template being used, there will be a high degree of homogeneity in responses to that compound. To the extent that there is a lack of conformance between these, the variability in response will increase.

> The similarity relation will be used in the response if there is no other semantic information schema central to at least one of the element nouns.
> In the case of conflicts between the linguistic template and the available semantic information schemas, the language user will do one or more of the following: create a new semantic information schema; accommodate schemas from one or both element nouns, usually from the head noun; create a "semantic skeleton" based on the linguistic template or a semantic information schema from one of the element nouns.
>
> The interpreter of a new noun-noun compound may violate established patterns in order to achieve an interpretation. (Ryder 1994: 96–97)

While all of these hypotheses were borne out to some extent by her findings, there was a smaller degree of variation for compounds that did not match plausible semantic schema associated with the linguistic template. One somewhat unexpected result was that the similarity relation was less strong as a default solution, competing in frequency with the construction of new event schemas.

2.4. Interim summary

Since many of the issues so hotly debated within experimental psycholinguistics do not seem to be irreconcilable, I will not side with any single model, but rather collect the requirements for a viable theory of novel N+N-compounds in an eclectic fashion. Seen from the hearers' perspective, which this paper focuses on, such a theory would have to come to terms with the role of the following factors:

- Hearers' familiarity with the conceptual structures, schemas and associated scenarios of the input concepts as well as general encyclopedic knowledge related to them.
- Specific pragmatic constraints determined by contextual and cotextual information.
- General pragmatic principles such as relevance and plausibility.
- Hearers' familiarity with the conceptual relations underlying N+N-compounds.
- Hearers' familiarity with the linguistic templates, i.e. word-formation patterns and their established meanings, as well as individual established lexemes serving as potential sources for analogies.

With this set of requirements in place, we can now embark on a discussion of conceptual blending theory and test its explanatory and predictive potential.

3. Conceptual blending: governing principles, vital relations and relevance

3.1. The basic setup

Mental spaces are envisaged as representations of structured sets of elements and the relations existing between them (Fauconnier 1994: 16). They are based on stored cognitive models but constructed anew online as required by the given situation (Ungerer and Schmid 2006: 258). During conceptual blending, people project conceptual material from two (or more) mental spaces into a new blended space. To take an example from Ryder (1994: 308), when confronted with the novel compound *bean-garden*, hearers will project selected pieces of information from the two input spaces BEAN and GARDEN and blend, as well as "compress" (cf. Fauconnier and Turner 2002: 89–139), them into a new, cognitively manageable and meaningful conceptual gestalt. The ensemble of input spaces and blended space as well as the inner-space relations and cross-space links and projections makes up a so-called *conceptual integration network* (cf. Fauconnier and Turner 1998). The overarching goal of blending is the reduction of conceptual complexity by means of compression to "achieve human scale" (Fauconnier and Turner 2002: 346 *et passim*).

Concomitant with compression, language processors generate emergent structure. For instance, six informants in Ryder's test defined the compound *bean-garden* as "a garden where beans *are grown*" (Ryder 1994: 308; my emphasis, HJS). Here the idea of an agent intentionally growing the beans is hardly prominent in the conceptual content typically associated with either *bean* or *garden* but only activated when the informants try to make sense of the compound. According to Fauconnier and Turner (2002: 48–49), emergent structure is a result of three types of blending processes. The first, *composition*, creates a locative relation between the main elements of the spaces BEAN and GARDEN, since this is the most likely and plausible link between the two inputs. This is a case of compression along the dimension of SPACE. A second type of blending process, termed *completion*, accounts for the fact that the concept BEAN fills a slot in the GAR-

DEN space detailing the type of plants or crops found in the particular type of garden denoted. Completion thus results in a PART-WHOLE relation of elements from the two different input spaces construed in the blend. And third, Ryder's (1994: 286–287) data for *bean-garden* show that her informants did not all envisage the type of garden encoded the same way, which would be explained by means of the third type of blending process, viz. *elaboration.* For example, the passive *are grown* in the definition quoted above emphasizes the vital relation of INTENTIONALITY, highlighted even more in the definition given by another informant: "a garden where *you* grow beans". Some informants thought it important to stress that the garden is "*full* of beans", another that it is a "place to grow beans *exclusively*" and yet another informant imagined "a garden in which *varieties* of beans are growing" (my emphases, HJS).

The large majority of the N+N-compounds tested by Ryder triggered blending processes of the simple type referred to as "single-scope networks" by Fauconnier and Turner (2002: 126–131). This means that the blended space recruits the major parts of its conceptual structure from just one constituent of the compound, usually the head, while content projected from the modifier fills in, specifies or adds to this structure and causes a certain amount of, but not a complete, conceptual reorganization of it. This tendency reflects the emphasis in Ryder's data on what traditional morphological terminology refers to as *determinative endocentric* compounds.

3.2. Governing principles and vital relations

Fauconnier and Turner encapsulate their predictions as to how a given blend is likely to be processed in terms of *governing principles* and *vital relations*. The principles and relations represent general cognitive, and to some extent pragmatic, constraints applicable to the full range of kinds of conceptual combinations envisaged by the two authors. Both governing principles and vital relations do not always converge in their effects but may conflict in given cases, with one or several of them getting the upper hand over others. Table 1 renders the (explicitly non-exhaustive) lists of governing principles and vital relations provided by Fauconnier and Turner (2002: 101, 346).

Given the limitations of this paper, these principles and relations can of course not all be explained, let alone discussed in detail. Some of the vital relations (e.g. SPACE and INTENTIONALITY) have already been mentioned

above; most of them will be dealt with in Section 4 below. As regards the governing principles, the example *bean-garden* has demonstrated that the conceptual structure of the GARDEN space stays intact (cf. the Topology Principle) and how it is complemented by material from the BEAN space (Pattern Completion Principle). My focus in the following will first be on the Relevance Principle, since it deserves much more attention than Fauconnier and Turner pay to it, and on the vital relations and the principles of their maximization and intensification. The reason for the choice of the latter is that it is here that blending theory can demonstrate its potential for modeling the understanding of novel N+N-compounds.

Table 1. Governing principles and vital relations (based on Fauconnier and Turner 2002: 101, 346)

Governing principles	Vital relations
For compression:	Change
	Identity
Borrowing for compression	Time
Single-relation compression by scaling	Space
Single-relation compression by syncopation	Cause-Effect
Compression of one vital relation into another	Part-Whole
Scalability	Representation
Creation by compression	Role
Highlights compression	Analogy
	Disanalogy
Other governing principles:	Property
	Similarity
The Topology Principle	Category
The Pattern Completion Principle	Intentionality
The Integration Principle	Uniqueness
The Maximization of Vital Relations Principle	
The Intensification of Vital Relations Principle	
The Web Principle	
The Unpacking Principle	
The Relevance Principle	

3.3. The relevance principle

Fauconnier and Turner (2002) define the relevance principle as follows:

> Other things being equal, an element in the blend should have relevance, including relevance for establishing links to other spaces and for running the blend. Conversely, an outer-space relation between the inputs that is important for the purpose of the network should have a corresponding compression in the blend. (2002: 333)

They go on to stress that the principle has both a general pragmatic function, by forcing participants in communication to make their contributions relevant, and a more specific one pertaining to elements within the blend and the network of spaces in which the blend is embedded. The latter, more specific idea of relevance is referred to as "network relevance" (Fauconnier and Turner 2002: 334) and is clearly the authors' main concern in their one-page treatment of the relevance principle. While this restriction is understandable, especially in view of the enormous scope of their undertaking, I think the authors underestimate the crucial role of the general pragmatic principle of relevance, highlighted amongst others by Grice (1975) and Sperber and Wilson (1995).

Relevance clearly plays an essential role not only in constraining the blending process, as Fauconnier and Turner suggest, but more fundamentally in actually triggering it. In the case of novel N+N-compounds, hearers and test informants feel forced to blend the two input spaces because they inadvertently assume that the two constituents of one single lexeme must be related in some way.[4] A particularly explicit manifestation of Ryder's informants' search for relevance is the afterthought in the response "a garden of beans (one wonders why)", demonstrating the informant's lack of satisfaction with the unspecific definition "a garden of beans" and his or her urge to come up with a convincing reason why *bean-garden* should be a plausible and relevant compound.

This expectation is due in turn to hearers' and informants' tacit default assumption, entrenched as a result of their experience with established products of word-formation, that compounds denote one single piece of experience. It is a product of the concept-forming power of words (Leech 1981: 32) and their hypostatizing effects (cf. Leisi 1975: 26; Schmid 2008). At the end of the day, the urge to search for relevant connections between the constituents is rooted in the well-known general principles of gestalt perception (and conception):

— Adjacency: the constituents of compounds stand next to each other.
— Proximity: the constituents are close to each other.

— Continuation: they form one phonological and, at least when spelt as one word or with a hyphen, one orthographic unit.
— Closure: the compound has spaces on either side in writing and is thus delimited against the surrounding co-text.

In short, the holistic, gestalt-like nature of compounds, no matter whether established or novel, triggers the search for 'internal' relevance which in turn triggers the process of conceptual blending. As predicted by Costello and Keane's (2005) plausibility constraint and Dunbar's (2005) pragmatic model, hearers embark on blending because they want to answer the question 'why are these two pieces of information presented to me close to each other, adjacent, as one internally continuous and externally bounded unit (i.e. one word) here and now in this context?'.

The relevance principle – understood in broad terms as suggested by Sperber and Wilson (1995; see also Wilson and Sperber 2003), but without many of their theoretical assumptions and implications – tells hearers that a novel compound used by a speaker is the optimally relevant linguistic stimulus compatible with the speaker's intentions: "every ostensive stimulus conveys a presumption of its own optimal relevance" (Wilson and Sperber 2003: 612). Relevance theory further predicts that hearers will search for contextual effects and intended contextual implications in order to make sense of the compound. They will form hypotheses about the conceptual relations that can be filled in as possible contextual implications. It is at this point that emergent structure actually begins to come up: emergent structure is the cognitive system's answer in the quest for relevance, even when confronted with highly implausible combinations such as Ryder's compounds *hamburger-shrub*, *elephant-web* or *garden-fan*.

This also suggests that the search for optimal relevance not only triggers blending, but actually determines the pathways and patterns of emergent structure, selecting the vital relations most pertinent to the integration network at hand. Following up on this, the prediction to be tested by the following secondary analysis of Ryder's experimental data is that informants who are asked to explicate the results of their blending activities by means of definitions will rely on vital relations as suggested by Fauconnier and Turner's maximization-of-vital-relations and intensification-of-vital-relations principles. The responses collected by Ryder will be analyzed with regard to the relations apparently activated by the informants during blending. As it would go beyond the scope of this paper to present an exhaustive analysis of all 4000 responses, I will restrict myself to highlighting those vital rela-

tions that are manifested particularly frequently (see Section 4.1), and to commenting on vital relations not manifested in the data (Section 4.2) and on conceptual links in evidence in Ryder's data that are missing in Fauconnier and Turner's framework (Section 4.3).

4. Testing the predictions of blending theory

To give readers who are not familiar with Ryder's book an idea of the data situation, here is an original extract from her appendix rendering the responses for the stimulus *bean-garden* (1994: 286–287; original emphases):

Linguistic template: X + Location = Location where X is found

BEAN-GARDEN

[Definition]	[General schema]
a garden of bean plants (2)	LOCOF*
a plot of beans	LOCOF*
a garden full of beans (3)	LOCOF*
a garden of beans (3)	LOCOF*
a garden of beans (one wonders why)	LOCOF*
a garden that grows beans (4)	LOCOF*
a garden that contains only beans	LOCOF*
a garden of only beans	LOCOF*
a place to grow beans exclusively	LOCOF*
a garden that has nothing but beans in it (4)	LOCOF*
a garden growing beans (2)	LOCOF*
a garden with beans	LOCOF*
a garden where snap beans grow	LOCOF*
a garden where beans are grown (6)	LOCOF*
a garden for growing beans	LOCOF*
a garden consisting of beans	LOCOF*
a garden of growing beans	LOCOF*
a garden where you grow beans	LOCOF*
a garden where there grow beans	LOCOF*
a garden with only beans	LOCOF*
plot of land to grow beans	LOCOF*
the part of the garden where beans grow	LOCOF*
a garden in which varities of beans are growing	LOCOF*

As the asterisk accompanying the name of the general semantic schema "location of" indicates, all answers were in accord with the expected schema. However, as mentioned above, the list also shows that the informants bring in a large diversity of additional kinds of ideas when blending the two concepts, for example, notions like "full of", "grows" or "you grow", "are grown" and "contains". These extra pieces of information will be subjected to an analysis in terms of vital relations. What is worth emphasizing at this point are several explicit signals of the search for relevance in the informants' minds to be found in the list: apparently many of the test subjects pondered about the reasons why *bean* and *garden* should be united in a compound, adding expressions like "one wonders why" mentioned above or highlighting the fact that "only", "exclusively" or "nothing but" beans are grown in this type of garden.

The following discussion is divided into three sections, one on vital relations that are confirmed by the data, another one on vital relations for which little or no evidence was found, and a third one on frequently constructed conceptual links emerging from the blending process which are less prominent in Fauconnier and Turner's work.

4.1. Vital relations confirmed by the data

A substantial number of the vital relations suggested by Fauconnier and Turner are more or less prominently manifested in the responses produced by Ryder's informants: CATEGORY, CHANGE, SPACE, TIME, IDENTITY, CAUSE-EFFECT, INTENTIONALITY, PART-WHOLE, PROPERTY, SIMILARITY, and UNIQUENESS.

The vital relation of CATEGORY is illustrated by Fauconnier and Turner (2002: 100) with the notion of *(computer) virus* as follows:

> what starts out as an outer-space analogy between a biological virus and an unwanted destructive computer program … is compressed into a Category relation in the blend: In the blend, the computer program is a *virus*.

Whether such a notion of CATEGORY, which apparently encompasses the traditional concept of figurative semantic change and category extension, is really a "relation" is perhaps an open question. What has emerged from the discussion of relevance, hypostatization and concept-formation in Section 3.3 above, however, is that the compression of conceptual content in the blended space into a single conceptual category is one of the overarching goals of the blending processes involved in the production and comprehen-

sion of novel N+N-compounds. For the informants, the compound *bean-garden* does not refer to one individual, but clearly denotes a sub-category of gardens, just like a *hamburger-shrub* is a sub-category of shrubs and a *knee-tub* a sub-category of tubs. Note that in the case of N+N-compounds, successful compression into CATEGORY does not depend on the existence of outer-space relations between the input spaces. It can occur even in the face of a striking lack of relations, as for example in the case of *hamburger-shrub*.

The relation of CHANGE is so general that it can be seen at work in most definitions found in Ryder's appendix and is thus not falsifiable. It is particularly dominant in the many responses where concepts are "accommodated" as Ryder (1994: 91–92, 141–142) calls it. Particularly striking examples include metaphorical and/or metonymic definitions like "a male-only bar" and "a place to get drunk" for the compound *man-cavern*, or "someone who hangs around their apartment" for *apartment-horse* (Ryder 1994: 303, 312). Here CHANGE can be interpreted as occurring in the more specific relation of SIMILARITY.

SPACE can be expected to play a major role in the locative and the container templates tested by Ryder (cf. Section 2.3 above). And indeed there is a strong tendency to be observed in the informants' responses to compress disparate notions about the dimension of space so as to achieve spatial proximity or a container-contained relation. This propensity is particularly strong when the head constituents are relatively straightforward cases of locative or container concepts, thus confirming Gagné's considerations concerning the dependence of relations on certain concepts, but less so her claim that modifiers are more important in that respect than heads (see Section 2.2 above). It is hardly surprising, then, that all responses to *bean-garden* quoted above reflect the general idea that beans are LOCATED IN a garden – a rationale that is so natural that we never stop to wonder how it comes about. Another interesting, though not very frequent, type of compression of SPACE can be observed for some responses for the compounds *boomerang-man* and *slingshot-man*, which reflect a metonymic construal where the object stands for a place with which it is strongly associated: "man from Australia" (named three times), "aborigine" and "aborigine (from Australian outback)" for *boomerang-man*, and "an African native" for *slingshot-man*. In general, it can be observed that the strong tendency to construe event-schemas representing images of possible events or processes, with the two constituents functioning as participants (cf. Ryder 1994: 140–141), often results in compression along the dimension of

SPACE, since the participants are brought together in one mental scene. Evidence is particularly strong in responses to the templates X + *man*, which evoke events involving the actions of raising, tending, driving, operating, using, selling and so on.

Event-schemas also foster compression on the dimension of TIME. The definition "a man who flies helicopters" proposed by as many as 17 informants for the compound *helicopter-man* is a typical example of how the constituent concepts are inadvertently brought together at one time in a fictive event. This is conceptually plausible even though the compounds are of course not temporally grounded, e.g. by finite verb forms or temporal adverbials. Representative of a very large number of reponses, the non-progressive form of the verb in *a man who flies a helicopter* manifests the tendency to add an aspect of habituality, iterativity and/or permanence. The rationale guiding the informants here follows the principle of optimal relevance: it only makes sense to refer to a person by means of a compound like *helicopter-man* if the person is not just flying a helicopter once but actually flies helicopters on a regular basis. (See Section 5 below for comments on the possible effects of the linguistic template/word-formation pattern.) The same consideration motivates the substantial number of responses dominating the locative templates which include references to *living* rather than just *being*, e.g. "a man who lives in the/an attic" produced by 12 informants for *attic-man*, "a cat that lives in the sea/by the sea" (4 informants) and "a cat who lives on a boat/on fishing boat" (4) for *sea-cat*, as well as "a hill where bears live" (5) and "hill inhabited by bears" (4) for *bear-hill*.

The relation of IDENTITY can be seen at work when informants construe so-called copulative compounds of the type epitomized in the stock examples *actor-director* or *study-bedroom*. Typically, IDENTITY in the blended space is the result of a compression of an outer-space relation of SIMILARITY connecting the central elements of the two input spaces. This occurs in responses to the target template animal like animal, and it is all the more frequent the more successful informants are in construing a relation of SIMILARITY. Whereas the blending of the two disparate animal concepts in *elephant-fish* compresses the difference into a SIMILARITY relation, cf. "large fish" (11 informants), "fish that looks like an elephant" (6) and "fish with a long trunk" (3), conceptually more compatible animals were compressed into IDENTITY: examples include *tiger-lion* ("a cross between a tiger and a lion", 10 informants; "half lion, half tiger", 3; "half tiger, half lion", 2) and, somewhat astonishingly, *cow-wolf* ("half cow, half wolf", 3;

"cross between a cow and a wolf", 2), which, however, is also compressed into SIMILARITY ("cow-like wolf", 4; "wolf as big as a cow", 3).

Like CHANGE, CAUSE-EFFECT is a very common but rather abstract conceptual relation difficult to operationalize. The most frequent realization of an important type of CAUSE-EFFECT relation occurs in the form of INTENDED EFFECTS, i.e. goals envisaged by animate agents participating in events. CAUSE-EFFECT is thus closely related to the very important vital relation of **INTENTIONALITY**, which in turn very much hinges on the concrete participant role of AGENT. As noted by Fauconnier and Turner (2002: 348–349), agents are inadvertently added to 'inanimate' scenes. That informants do tend to construe the role of agents can be gleaned from a number of frequently used linguistic strategies:

- the use of generic *you* as in "a garden where you grow beans", "a ditch where you grow gardenias" or "an attic you keep clothes in" for *bean-garden*, *gardenia-ditch*, and *clothes-attic* respectively;
- passive voice clauses of the type "a garden where beans are grown" (6), "a ditch (or furrow) where gardenias are grown" (2), and "an attic where clothes are stored away" (2);
- volitive infinitival or *for*-V-*ing* constructions of the type "a garden for growing beans", "a ditch to grow gardenias", "an attic to store clothes in";
- expressions of the type "used for" or "used in", as e.g. in "table used in camps" (20) or "table for use at a campsite" for *camp-table*.

It will hardly come as a surprise that the templates X + *man* and animal + animal regularly produce compression into INTENTIONALITY since it is only natural to attribute willful and goal-directed behaviour to human beings and higher animals: cf. e.g. "goat herder" (7), "man who tends goats" (5), "man who takes care of goats" (4), and "man who raises goats" for *goat-man*. INTENTIONALITY turns out to be a dominant aspect of emergent structure in the blend whenever human referents are involved, even in cases that target locative relations. For instance, as many as 24 out of the 40 informants connected the constituents of *closet-maid* by the link "who cleans", thus compressing not only SPACE and TIME (habituality) but also INTENTIONALITY as a result of the blending process. It is exciting to observe here how the combination of the locative concept *closet* and the professional denomination *maid* seems to restrict the most likely conceptual link so strongly that

more than 60% of the informants immediately conjure up the idea of cleaning – after all, what else should a maid do in a closet?

The relation of PART-WHOLE is less conspicuous in Ryder's data than its undisputable role in the processing of perceptual input would suggest. This is probably due to Ryder's choice of templates, however. Had she decided to study meronymic N+N-compounds of the type *door-handle* or *coat-collar*, for example using stimuli like *table-handle*, then the PART-WHOLE relation would clearly have turned out more prominent. As things are, the relation only crops up in very few of the responses, among them "the rails on a hospital bed" for *bed-cage*, "a knob on a person's foot" (2) for *foot-knob*, and "toe of a goat" as well as "a goat's toe" for *goat-toe*.

PROPERTY is indeed, as Fauconnier and Turner (2002: 99–100) argue, a basic and ubiquitous vital relation. A very general process amply illustrated in Ryder's data is the compression of all kinds of outer-space relations into PROPERTY in the blended space: in *bean-garden*, for example, the locative relation established across the two spaces and compressed in the blended space also results in the establishment of a PROPERTY relation: bean-gardens are characterized by having the property of having beans in them. However, as we have seen, an inner-space relation of PROPERTY in an input space, e.g. 'elephants are large animals' and 'elephants have a trunk', can be compressed into a SIMILARITY relation in the blended space (cf. "large fish", fish with a long trunk" above). Note that this kind of compression only works with highly salient attributes which are characteristic of the input concepts (i.e. have a high cue validity, in technical terms). This is also true of the examples given above, where PROPERTY in the input space ('typical of' or 'typically associated with') is compressed into location, as in "man from Australia" for *boomerang-man*.

The vital relation of **SIMILARITY** has already been mentioned in the context of CHANGE, IDENTITY and PROPERTY. It has been shown that an outer-space relation of SIMILARITY can be compressed into IDENTITY (*tiger-lion*) and how an outer-space relation of PROPERTY can be compressed into SIMILARITY. As hypothesized, and to a large extent also confirmed, by Ryder (1994), SIMILARITY is often a default vital relation established in the blended space when other plausible links are not available or difficult to construe. A frequent dimension invoked is SHAPE, for example in responses like "a chair that is shaped like a box" (8) and "a square chair" (6) for *box-chair* (1994: 337) or "a barrel-shaped pillow" (14) for *barrel-pillow* (1994: 335). Other dimensions are COLOUR, FUNCTION, SIZE, SOUND, and TEXTURE (cf. Ryder 1994: 285).

Finally, the vital relation of UNIQUENESS, not elaborated on very much by Fauconnier and Turner (2002), seems to be a common solution in the search for relevance. The responses to the stimulus *bean-garden* quoted at the beginning of section 4, which include the uniqueness markers *only*, *exclusively*, and *nothing but*, illustrate the informants' tendency of the informants to assume that the creation and use of a novel compound is motivated by something very particular or essentially unique. To give another example, responding to *town-pencil*, some informants wrote "the only pencil in town" or "a pencil to be used only in towns".

4.2. Vital relations not confirmed by the data

The existence of vital relations that are proposed by Fauconnier and Turner (2002) but not manifested in the N+N-compound data must not be mistaken for a falsification of their theory. As the two authors never claim that all governing principles and all vital relations must play a role in all conceptual blends, there is little damage done to their model in observing that Ryder's dataset does not include evidence for the vital relations of ROLE, REPRESENTATION, ANALOGY, and DISANALOGY. These relations capture links of the type 'person – social role' (e.g. President, CEO, etc.) and 'person – picture of person' as well as structural analogies (and disanalogies) across spaces resulting from ROLES and REPRESENTATIONS.

What we can perhaps deduce from the lack of evidence in the data is that these vital relations, at least in the conceptions envisaged by Fauconnier und Turner, may be conceptually less 'vital' than the other very basic conceptual links discussed in the previous section. From a cognitive point of view, it may indeed come as no surprise that fundamental ways of linking perceptual input and conceptual content, which arguably also underlie many other linguistic phenomena, turn out to be of particular importance for the understanding of novel N+N-compounds. Thus, as we have seen, the relations of PLACE, TIME, and INTENTIONALITY reflect the tendency to construe conceptual coherence by means of placing participants in event schemas, which also provide the cognitive underpinning for simple clause patterns; and links such as CATEGORY, SIMILARITY, IDENTITY and PROPERTY are undoubtedly instrumental for the ubiquitous presence of phenomena like metaphor and metonymy in natural languages.

4.3. Other conceptual links suggested by the data

In Section 4.1 I have somewhat generously subsumed the habitual aspect frequently surfacing in the responses under compression of the vital relation of TIME. Whether habituality, permanence and iterativity are indeed notions that are related to our conception of TIME is a larger question I cannot address here. It is important to emphasize, however, that the informants' tendency to imagine the event schemas triggered by many compounds as being types, or indeed categories of recurrent events, is motivated by the relevance principle. As already explained in Section 4.1, it is precisely the potential recurrence of an event-type that appears to turn a combination of concepts into a "nameworthy" category (cf. Downing 1977). For example, the one-shot image that a particular man is in a particular cave at a particular time would hardly motivate the creation of a compound like *cave-man*, unless perhaps we want to distinguish the *cave-man* referentially from, say, *a tree-man* found nearby (as in Downing's famous *apple-juice seat*). Basically, the creation and use of a compound only makes sense under the following circumstances: either if we imagine the man, *the* cave-man, as living a hermit-like life in a certain cave on a long-term basis, or if we assume the existence of a societally shared category of men whose primary shelter and place of living are caves. In either case, the implicit assumption is that *the cave-man* or *the cave-men* are parts of knowledge shared by at least certain sections of the speech community – otherwise the use and creation of a compound would not be consistent with the principle of optimal relevance. As argued in greater detail in Schmid (2008), even deictic uses of nonce-compounds involve the pretence that a societally nameworthy category functions as denotatum of the complex form, because the concept-forming power of words, especially nouns, is so strong.

The relevance principle also motivates the frequent use of expressions like *full of* and *filled with*. On the one hand, just like the many *be-in* expressions, these reflect the important role of the CONTAINER-relation. While it may not be implausible to treat this relation as a variant of the PLACE-relation, the image-schema of a CONTAINER automatically raises the question of the amount of material or substance contained in the container. Informants apparently prefer to see the containers as being "full of" or "filled with" substance (e.g. "a garden full of beans", 3) because, again, they consider these extreme values as providing motivations for the use of a compound. Interestingly, this tendency can be observed not only in the res-

ponses for stimuli based on the CONTAINER-schema (e.g. "a barrel filled with beans", 3; "a barrel full of beans", 6, for *bean-barrel*) but also in those for many locative concepts as in *bean-garden* and "a field filled with tables" (4), for *table-field*. In terms of blending theory, two processes can be seen at work here: a compression of SPACE into the more specific variant of CONTAINMENT, and a remarkable *scaling* of substance from unspecified amounts to fullness. The latter process is captured in blending theory in terms of a governing principle for compression (see Table 1 in Section 3.2) dubbed "single-relation compression by scaling", which does not feature prominently in Fauconnier and Turner's work.

A final notion worth mentioning is captured in the relation-based approaches (see Section 2.2) by the link MADE OF. It can be gleaned from definitions like "a garden consisting of beans" for *bean-garden*, and "a river of books" (2) and "a river made of books" (3) for *book-river*. Here parameters like MATERIAL and SUBSTANCE, arguably again basic elements of how we make sense of the world around us, come into play.

5. Discussion and conclusion

In trying to assess the explanatory power of blending theory it seems reasonable to come back to the requirements outlined in Section 2.4 above. The first requirement concerning hearers' familiarity with the conceptual structures, schemas and associated scenarios of the input concepts and encyclopedic knowledge related to them is to a large extent an inbuilt element of blending theory, since this is essentially what the notion of mental space hinges on: the activation and context-dependent re-organization of concept-related knowledge structures stored in long-term memory. The same goes to a large extent for specific pragmatic constraints determined by contextual and cotextual information. The third requirement capturing general pragmatic principles such as relevance and plausibility is integrated in Fauconnier and Turner's model in the as yet fairly unspecified Relevance Principle. In Section 3.3 above an attempt has been made to spell out how some aspects of a simplified notion of optimal relevance adopted from Sperber and Wilson's work could account for the dataset investigated here.

The bulk of this paper has consisted of testing the predictions of blending theory concerning the fourth requirement related to hearers' familiarity with conceptual relations underlying N+N-compounds. Essentially, blending theory would claim that a set of fairly general vital relations, which are

applicable to a wide range of differents kinds of blends, should be at work in the understanding of novel compounds as well. And indeed, the investigation has shown that a substantial number of cognitively fundamental relations proposed in blending theory are confirmed by the data. Other relations do not seem to play a role in the kinds of blends studied, while a small set of conceptual links not dwelt on by Fauconnier and Turner were also found to motivate the informants' responses. In addition to the vital relations, a number of blending theory's governing principles were confirmed by the evidence. On the whole, then, the general cognitive predictions of the theory appear to be borne out and do not seem to be in need of major revisions.

Being a fairly general cognitivist theory of conceptual merging, blending theory clearly may be expected to fare less well when it comes to accounting for the role of specific word-formation patterns and even individual lexemes serving as potential sources for analogies. This may well turn out to be untrue, however. For one thing, the unconscious comparison of possible meanings of a novel compound with templates stored in long-term memory lends itself to descriptions in terms of conceptual blending. No matter whether Ryder's informants resorted to the expected schemas or created new ones, there is ample evidence that they tried to make sense of the compounds in terms of conceptual structures suggested by familiar patterns and/or exemplars. From this perspective, the blending processes involved in the comprehension of novel compounds is only a variant of the more general assumption that blending is at work in the processing of grammatical constructions and their variants (cf. Mandelblit 2000; Fauconnier and Turner 2002: 178–179).

More fundamentally, it is possible to reverse the relation between established patterns and online blending processes. That established meanings of word-formation patterns serve as bases for analogies during blending seems intuitively plausible. However, it is by no means unlikely that the semantic patterns themselves ultimately are the results of repeated and therefore entrenched blending processes originally triggered by the search for relevance and guided by the general cognitive governing principles and vital relations very much along the lines explained in this paper. Historically, patterns that are well established today must also have started out as nonce-formations at one point, which may have been coined by speakers, and understood by hearers, with the help of the general cognitive and pragmatic principles outlined by blending theory and focused on in this paper. Form such a perspective, conceptual blending would transform from being an

appendix to word-formation theory specializing in explaining creative nonce forms to constituting a viable model for the emergence of word-formation rules.

Notes

1. Coulson (2001: 126–133) includes a discussion of nominal compounds focusing on the examples *gun wound* and *caffeine headache*.
2. The same procedure was used in a recent study by Štekauer (2005), which will not be in the focus of attention here because the material is much less varied and rich than Ryder's.
3. My focus throughout will be on the first experiment reported on by Ryder (1994).
4. Readers may well feel inclined to object that Ryder's informants were not forced to blend by their search for relevance, but because they were told to do so in the test instructions. However, artificial as the situation may be, it is probably only different from similar tasks in everyday communication with respect to the lack of cotext and context.

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