



Semantics and Cognition **An interview with Gilles Fauconnier**

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Gilles Fauconnier is a linguist and cognitive scientist internationally known for his work on the theory of Mental Spaces and on the theory of Conceptual Integration or “Blending”, in partnership with Mark Turner. His contribution to Cognitive Semantics in particular and Semantic Theory in general is invaluable. The theory of mental spaces allows refined treatment to a series of semantic phenomena that have always challenged semanticists such as *referential opacity*, *conditionality*, *counterfactuality*, *presuppositional projection*, among others. The theory of conceptual blending also enables the advanced treatment of the complex cognitive construction of the linguistic meaning underspecified in grammatical constructions, which offer clues or means of activating the cognitive process of blending, as the *XYZ grammatical construction* prototypically illustrates. Another central topic concerns the relationship between the semantic-cognitive processes of blending, metaphor and metonymy, their typological limits and their intersections. Consequently, the high explanatory power of blending invites us to reflect on its centrality in cognition and grammar for the construction of linguistic meaning, as well as on its economy, which includes its restrictions.

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Origins of cognitive semantics and mental spaces

ML & JL: You have produced important works in different domains of linguistics, such as logical semantics, the syntax-semantic interface, the problem of anaphora (the theme of your doctoral thesis), quantification, scalar implicature, and so on. Could you comment on how you became a cognitive semanticist? What were your motivations to develop a theory of reference like *Mental Spaces*?

GF: Many things in modern linguistics start out with Noam Chomsky and his students and students of his students. Chomsky was wrong in many ways, but he had two fundamental insights which changed the direction of linguistics in the 1950's and paradoxically opened up the field towards the very fruitful methods and theories of cognitive linguistics, although this was a path that he himself was not destined to follow. The first insight was that there were deep and complex principles at work behind the observable regularities (and irregularities) of language, that such principles could not be scientifically deduced directly from surface distributions, but rather followed from properties of the mind/brain – i.e. human mental attributes, and that just as in any other science, imaginative theories had to be devised to account for what was going on. The second insight was that speakers of language had knowledge not just of how to say things, but also of how NOT to say things, i.e. knowledge of what was ill-formed, and that this knowledge could be examined, not by direct observation (which only sees what is well-formed), but by query: submitting constructed examples to native speakers who could judge them to be ill-formed or not.

Somewhat tragically, this opening up of linguistics came without a semantics. Autonomous syntax was carried over from structuralism – Chomsky was a student of the brilliant syntactician and creator of transformational grammar Zellig Harris. For people like myself entering the field in the early 1960's the autonomy of syntax made no sense at all. It seemed completely obvious that grammar played a key role in the construction of meaning and that somehow this was the very essence of language. I had studied advanced mathematical logic with Daniel Lacombe in Paris and my first impulse was to look for logical properties of grammatical structures (surface or underlying). I was not the only one to think along those lines: levels of logical form were quickly incorporated into grammars, as for example in generative semantics or in Montague grammar. So-called formal semantics became an important subfield of linguistics, with the aim of filling in the gaping hole left by meaning-free autonomous syntax. Two major difficulties appeared. On the one hand, by analogy with mathematical logic, sentences of language were reduced to logical formulas at some level, and semantics became the study of the truth conditions of these formulas. This was a problem because there was abundant evidence that there was much more to sentences than just truth conditions, and in fact it was dubious that sentences out of context had truth conditions at all. The other difficulty was that sentences with their logic and their syntax were viewed as platonic objects independent of cognition or mental activity, an

unfortunate consequence of some dogmas of analytic philosophy.

So you ask: *How did you become a cognitive semanticist?* And the answer is very much the same for me as for my friends and colleagues, Langacker, Talmy, Lakoff: the study of language gave us no choice, semantics proved to be deeply and richly cognitive, and inextricably intertwined with syntax, so that if we were going to be linguists, we would certainly be cognitive semanticists. What each of us had found, among other things, was that a natural language sentence is cognitively complex, because it gives an array of diverse instructions for building meaning in context. When there are truth conditions, they are the end point of this elaborate mental construction, not its basic and logical starting point.

Why, do you ask, develop a theory of reference like *Mental Spaces*? Well, first of course, accounting for the data: many linguistic examples throughout the mental space book are not readily treated within the philosophical tradition or within formal semantics. But perhaps equally important are the generalizations obtained by this cognitive approach: the pragmatic function phenomena observed by Nunberg, the opacity of belief contexts that have puzzled philosophers for so long, the properties of image contexts insightfully studied by Jackendoff, the conundrum of presupposition projection, and the nature of “worlds” and counterparts in natural language semantics, all follow from a unified and remarkably elegant set of access and floating principles operating within and across mental spaces.

Why then isn't every semanticist a cognitive semanticist? That is indeed hard to explain... But historically, here is what happened. As mentioned above, formal semantics borrowed a great deal from the logic prevalent in analytic philosophy, with thinkers like Quine, Kripke or David Lewis. There was a strong anti-mentalist sentiment in that tradition. Reference was directly to the real world or possible worlds, without recourse to mental constructions of the kind today pervasive and foundational in cognitive semantics, for example in the work of Talmy and Langacker. The anti-mentalist view was very strong in the 1950's and accorded well with the dominant behaviorist psychology of the times, as for instance in Skinner's work. Now, what Chomsky did with great success was to challenge this anti-mentalist view for language and language acquisition. But, as already noted, he did it for syntax only, leaving semantics totally out of the picture. The philosophers, who knew nothing of syntax, were forced to defer to a linguistic view of grammar, while steadfastly clinging to a non-mental, purely truth-conditional, and totally compositional view of meaning (as in the mathematical logic of Tarski). As a result of this largely historical accident, we were stuck with a hybrid conception of language, mentally and even neurobiologically based for syntax and phonology, narrowly logical and truth-conditional for semantics.

That is why the study of meaning evolved in the way it did when cognitive linguistics took off. Because it was not constrained by the anti-mentalist and truth-conditional dogmas, it looked at far more phenomena than the philosophers had, for example figure and ground,

viewpoint, fictive motion, metaphor and metonymy, scalar implicatures, frames and cognitive models, ... However, philosophy had not been useless: it had insightfully discovered and discussed fundamental issues, e.g. opacity in belief contexts and comparatives, presupposition, quantification, reference and anaphora, implicature, entailment. What mental spaces did was to take a cognitive approach to many of these issues, so that they could be explained further, unified, and generalized.

Presupposition

ML & JL: A very appreciable phenomenon in your work is that of *presupposition*. Could you talk about the advances in the understanding of presuppositional phenomena in a semantic approach based on mental spaces?

GF: Presupposition was precisely the type of phenomenon that came to the attention of philosophers, because it had no equivalent in standard logic. The initial observation was simply that negation had no effect on the presuppositional part of a sentence. *Dick knows that you're wrong* and *Dick doesn't know that you're wrong* both entail that you're wrong. This observation was extended and generalized to contexts with multiple operators and embeddings. The general problem became to predict when presuppositions linked to an embedded form would survive and when they would be cancelled. Various strategies were proposed, all within the conceptual frame of truth-conditional semantics plus some pragmatics.

Here again, there were issues of observational adequacy: the cancellation and combinatorial strategies did not account for the full range of facts. But also, they lacked elegance and generality. What the mental space conception offered was a very general and simple account, where the presuppositions floated up from one layer of embedding to the next, but were barred from floating any higher by a contradiction or an explicit or entailed version of themselves occurring earlier in discourse. And that conception would automatically leave the presupposition satisfied in all the spaces through which it had floated. So for example, given the sentence *Luke believes that Mary wants the king of France to visit*, the default would be for the presupposition (there is a king of France) to float from Mary's desires to Luke's beliefs and to the Base space (speaker's reality). But prior specification that Luke doesn't think there is a king of France would block the floating at the level of Luke's beliefs. And prior specification in the Base that there is no king of France would block the floating at the Base level. The full discussion of such cases in Chapter 3 of *Mental Spaces* makes it clear that presupposition projection (namely floating and transfer) is not a property of the sentence alone, but rather of the full mental space configuration in discourse and context.

The mental space approach yielded results that overcame deficiencies of both the combinatorial and cancellation theories. Furthermore and very importantly, it yielded such results within a framework that is more general and simpler conceptually than the ones envisaged

in the narrowly truth-conditional scheme. That simpler framework is available for independent reasons: the extension of opacity and pragmatic functions on the one hand, and the more recent work on roles and values, and conceptual blending on the other.

There is another way in which a better framework can advance the understanding of presuppositional phenomena: by revealing new data which had not been recognized in other approaches. In mental space terms, the general question is: what happens to presuppositions born in one space and satisfied in another. Presupposition float is part of the answer, but it turns out that there is also presupposition transfer from higher spaces to lower ones, by virtue of a signal in the lower space. Examples like the following show this:

Hey look, in that picture Luke has stopped smoking.

[context: Luke is a chain-smoker who is and looks unhealthy in reality, but in the picture he is represented without a cigarette and with rosy cheeks]

stopped triggers the presupposition that Luke used to smoke, but that presupposition is satisfied in the higher reality space, not in the lower “picture” space. I discuss many such examples in the mental space book, for instance:

According to George, Lucy is no longer beautiful.

[context: speaker knows that Lucy used to be beautiful, but George doesn’t]

Presupposition transfer is a generalization of the Access Principle. Instead of⁴ describing an event in terms of its properties in the lower space, the speaker uses a description of the counterpart of the event in the higher space.

We notice this type of phenomena, because we ask the question within the mental space framework. To my knowledge, these facts had not been observed before.

Now, another fundamental aspect of the mental space approach is that it applies seamlessly to cases involving metaphor, metonymy, and more generally conceptual blending. Formal semantics inherited from analytic philosophy a great disdain for metaphor, and figures of speech generally, keeping them out of sentence logic. Cognitive linguistics on the other hand showed how central such mappings are to the construction of meaning.

So, take Sweetser’s example⁵:

If the Ile de la Cité is the heart of Paris, then the Seine is the aorta.

This *if*-construction is not a logical entailment, but rather an instruction as to how to

4 The Access Principle was called the Identification Principle (I.D. Principle) in the original *Mental Spaces* book.

5 From the Foreword of the 1994 edition of *Mental Spaces* (Cambridge University Press).

perform the metaphorical mapping (human body → city). It is straightforward in mental space terms, but not in logic-base theories. But examples like this can also contain presupposition constructions:

If the Ile de la Cité is the heart of Paris, then we know that the Seine is the aorta.

The complement of factive verb *know* is presupposed: *the Seine is the aorta*. It floats up and meets *the Ile de la Cité is the heart of Paris*. What is assumed here by the speaker is that if we know part of the mapping (heart → île de la Cité) then we also know another part of the mapping: aorta → Seine. So *the Seine is the aorta* follows (metaphorically) from *the Ile de la Cité is the heart of Paris* and is not inherited as a presupposition of the entire sentence. In other words, the metaphorical case is treated⁶ entirely by the same principles as non-metaphorical ones like:

If John has children, we know that he is a father.

he is a father (complement of factive *know*) is an implicit presupposition in the lowest space. When it floats up, it meets *John has children*, which entails an explicit *he is a father*. And therefore it can float no higher: it is not a presupposition of the full uttered sentence.

From a cognitive linguistic perspective, the two cases, metaphorical and non metaphorical, are the same. But from a logic-based perspective, they are quite different. *John has children* logically entails *John is a father*. *The Ile de la Cité is the heart of Paris* means something like *The Ile de la Cité is the center of Paris*, which logically entails nothing about aortas.

Another point of contention in work on projection of presuppositions was their status: logic-grammatical or discourse related (old vs. new information). There were arguments in favor of each, but no satisfactory answer. Because mental spaces are part of discourse construction, the framework allows grammar and discourse construction to interact. The grammar triggers implicit presuppositions, and prior knowledge or assertions trigger explicit presuppositions for later discourse. As the mental space construction unfolds to build discourse, explicit and implicit presuppositions interact, as mentioned above, to determine in what spaces the presupposition is satisfied (essentially the “projection problem”).

Modals

ML & JL: Cognitive Semantics usually treats canonical modals in relation to their embodied base - E.g., force-dynamics metaphors (TALMY, 1985; JOHNSON, 1987) and their applicability in the content, epistemic and speech act domains (SWEETSER, 1990). However, the use of modals also displays projections (FAUCCONNIER, 1994) that indicate inferential reasoning, right? Imagine a couple who is isolated at home because of covid-19. The wife

⁶ see *Mental Spaces* (1994, p.87).

looks for the trash can in the kitchen, but cannot find it. So, she thinks, “Mark *must* have taken it outside”. This illustrates the mapping of an inference about probability or possibility. Now, if we consider constructions such as “It *might* rain today.” / “It’s *going* to rain”, we have two different reasonings of probability of a fact. These considerations lead us to some questions from the point of view of mental spaces: how do we construct the reasoning projected by modal forces as in the exemplified contexts? Do you consider it a valid alternative hypothesis that the image scheme of scale is feeding into the mental spaces that underlie a probability / possibility inference about a fact, or do we deal only with causal forces?

GF: Following Sweetser and Talmy, I take it that modals express force dynamics in three domains, content, epistemic and speech act. In all three domains, modals open up mental spaces. The evidence for that comes from the fact that they display the same opacity and presupposition properties as other space builders.

Consider:

The president must be very honest.

Call R the base space and M the space created by the modal, p the role of president in R, p’ its counterpart in M.

In each domain (content, epistemic, speech act), we have three readings depending on whether Access and Role-Value apply.

Take the epistemic domain. Suppose first that p has a value, say Clinton. Then if the Access principle applies to Clinton, the counterpart of Clinton in space M will have the property “very honest”. This is the reading where the speaker is saying that Clinton is probably very honest.

In another reading, the president describes the role p’ in M. This is the reading where it’s probable that any president will be honest.

In a third reading, p has no value in R (speaker doesn’t know who is president or even if there is a president) but p’ has a value (someone is president) and the meaning is that there is probably a very honest man who is president. This 3rd reading is most plausible (pragmatically) if the context is about some little known country. The speaker speculates that there is probably an honest president in that country.

In the content domain, we get similar readings for the same sentence: obligation for Clinton to be very honest; obligation to choose a very honest president, obligation to be very honest for the individual who happens to be president.

In the speech-act domain, think of imagining a story or a scenario. The three readings illustrate the force dynamics of constructing the story. One reading has the character representing Clinton who is president in reality, and the sentence can express that the construction of the story

requires this character to be honest. Another reading (*the president* describing p') constrains the story to represent the role of president as including honesty. A third reading (value of p') indicates that in the story, some honest individual is president, even if there is no president in reality.

What is essential here is that the mental space configurations are the same for the three domains. The example sentence *The president must be very honest* is (at least) nine times ambiguous, depending on which of the 3 mental space configurations is chosen and which of the 3 force dynamic domains is chosen.

Native speakers have the capacity to construct the mental spaces, and they also independently have knowledge of force dynamics experienced in physical and social domains, and projected metaphorically to epistemic and speech-act domains. That knowledge is used upon hearing the utterance to decide which domain is relevant in a particular context and discourse. It's also part of that general knowledge that in the epistemic domain the modals map onto a probability scale: in a domain of reasoning, a greater force pushing metaphorically towards a certain conclusion corresponds to that conclusion being more probable. The scalar nature of the modals will be very familiar to the native speaker. Take for instance the distribution of **even** which marks a scalar end point⁷ :

It's possible and even probable that the president is very honest.

The president may be, and even must be, very honest.

* *It's probable and even possible that the president is very honest.*

* *The president must be, and even may be, very honest.*

The modals remain on a scale of force intensity in the non-epistemic domains as well. *The president may be, and even must be, very honest* can be interpreted as an obligation (social domain) or as a speech act building up the world (e.g. in a scenario).

So the broad answer to your question is that users of language have mastery of scales and mental spaces simultaneously. The modal used tells us where on the scale the lower mental space will be placed.

Partial clues

ML & JL: For the cognitive construction of linguistic meaning, some kind of cross-mapping between language and thought is necessary. In Fauconnier (1994), you say that grammar offers only partial clues to the cognitive construction of meaning, for example, *space builders*. You argue *that mental spaces as constructions that are distinct from linguistic structures, but*

⁷ The asterisk, *, indicate unacceptability or ill-formedness.

constructed in any discourse according to the guidelines provided by linguistic expressions (p.16). This means that the cognitive construction of meaning depends on the contribution of some level of linguistic information, even if the compositionality is partial. This leads us to the following question: if grammar offers clues as to the activation of mental spaces, how do we deal with the fact that these clues may not be grammaticized in the language? For example, for the expression of definiteness, some languages, such as English, have a definite article that precedes a noun whose referent can be introduced into a mental space. However, languages like Russian do not have this linguistic device. Is it a false question? If not, how do you see relationships we can establish between space builders, grammaticization, and linguistics typology?

GF: You ask why languages differ greatly in what gets grammaticized. And you ask if this might be a false question. No, it's not, it's a great question, but unfortunately I don't have the answer. The best I can do here, which may still be useful, is to change the background for the question. When it was assumed that the full meaning resided in the linguistic form (the sentence), it was sometimes assumed that the difference in overt grammatical markings showed a difference in expressive power. There was research claiming for example that Mandarin Chinese could not express counterfactuals, mainly because it did not have the kind of "if + tense/mood" construction that English and many other languages have. Not surprisingly this turned out to be wrong. What cognitive linguistics reveals and emphasizes is that the amount of construction and knowledge not explicitly in the grammatical form of a sentence is considerable, and so we need to look at the overall cognitive resources that are brought to bear, including multimodal clues and instructions for space building. Let me illustrate with an example that I discuss elsewhere in great detail ⁸:

Martina is three points away from the airport.

I heard this myself once on the radio. The context was a tennis match, and Martina is the famous tennis player, Martina Navratilova, and she was playing in the tennis match. This was a broadcast on the radio and the sportscaster was informing us that Martina was losing, and that if she lost three more points in the tennis match, she was going to lose the match, and as a result of losing the match she was going to be eliminated from the tournament, and therefore she was going to have to go home. If she went home, she would take a plane, and to take the plane she would have to be at the airport. As you can see, the sentence is massively compressed. In order to understand it, we must use several Idealized Cognitive Models⁹, a metaphor of event structure, a conceptual event metonymy, a metonymic model of travel, and causal compression and decompression.

This is something traditional linguistics has never even noticed. And it's something

⁸ Fauconnier, Gilles. *Ten Lectures on Cognitive Construction of Meaning*. Brill, Leiden and Boston, Lecture 3. 2018.

⁹ Lakoff, G. *Women, Fire and Dangerous Things*. University of Chicago Press. 1987.

ordinary people don't know and don't have to know. In everyday life, language seems to contain all the information about meaning that you need: if you say something, it has a meaning, and that's how you know how to interpret it. But in fact, most of the meaning is already in your brain, and what language is really doing is triggering the right operations in your brain that will produce this very expansive meaning.

So in our *Martina* example, not a single one of these elaborate operations is signaled with an explicit grammatical device, and yet there is no cognitive effort: it goes by very fast, eight words, a few seconds, maximum, to be processed in our head, without effort. This is a very important feature of language and thought: very elaborate meaning constructions that are not perceived as complex at the conscious level. They do not trigger cognitive effort.

What all this means for grammaticization is that a huge proportion of the meaning construction is done without grammatical clues. In itself, this does not answer your question about why languages differ in what they signal explicitly, but it puts it in a different light. Because so much is implicit, the heavy lifting is done only very partially by grammatical elements. Furthermore, the same apparent grammatical resource can have multiple uses which vary from language to language. So take the case you mention, the definite article. It is notoriously difficult to pin down its "meaning". Long dissertations have made the attempt and revealed the unsuspected complexity of "the"¹⁰. Once a language has the syntactic definite article, it will use it in a variety of ways. If it doesn't have that particular syntactic marker, it will use other resources, very often implicit ones. Take the first sentence of Hemingway's *A Farewell to Arms*, cited by Epstein:

In the late summer of that year we lived in a house in a village that looked across the river and the plain to the mountains.

The definite article here does not indicate any prior mention or presupposition of a plain, a river, or mountains. As Epstein notes, the referents are identifiable to the narrator, not to readers. In a Russian translation with no articles, a reader will also know explicitly that novel referents are introduced, and will infer implicitly that they are already familiar to the narrator (by virtue of conventional framings of story telling). Or take another of Epstein's examples:

[researchers backing off a wrong claim they had made]

We took the wrong number and multiplied it by the wrong number.

Understanding this requires background frames for multiplication and research. Presumably (I haven't been able to check) a Russian translation with no articles would convey exactly the same content in that context.

¹⁰ See Epstein, R. The definite article, accessibility, and the construction of discourse referents. *Cognitive Linguistics*. 12-4. 2001.

In other words, a meaning in context is very rich, has lots of nuances, very few of which are grammatically marked. Furthermore, even if one language seems to have a more explicit marking, it doesn't follow that that language has to use it. Consider counterfactuals again. In *The Way We Think*, Turner and I bring up the case of a philosophy teacher defending an idea and saying:

Kant disagrees with me on this point, he claims “blah blah”, but I answer ...

This is a blend bringing Kant into the argument on the basis of what he wrote. What results is a debate between the philosopher and Kant. And it is counterfactual. Kant is long dead and could not join the conversation. Through blending, this counterfactual is expressed in the simple present tense, with no counterfactual grammar (*if...mood/tense*). The speaker (the philosopher in this case) could express the same thing with a whole range of more and more explicit counterfactual clues (i.e. grammatical markings):

Kant would disagree with me on this point, he would claim ...

Kant would have disagreed with me on this point, he would have claimed ...

If Kant were here, he would disagree with me on this point, he would claim ...

If Kant had been here, he would have disagreed with me on this point, he would have claimed ...

If Kant were with us and alive today, he would disagree with me on this point, he would claim ...

If Kant had been with us and alive today, he would have disagreed with me on this point, he would have claimed ...

Only the last formulation uses the full force of English counterfactual grammar and lexicon (*alive*). And yet the seven formulations are understood in that context as equivalent. And they are all readily understood with little cognitive effort. In fact, the first one (with the less grammar) probably has the lightest cognitive load in context.

Implicit communication and invisible meaning: implicatures

ML&JL: In *Mental Spaces*, you say “A sentence in natural language is cognitively complex ...” because it incorporates information at various levels - lexical, syntactic, presuppositional, and so on. One of these levels is certainly rhetorical and pragmatic information, as evidenced by words like “even” or hedges like “loosely speaking”, which involve implicational procedures or modalize the predication of a modified expression (KAY, 1979). In *Mappings* you observe that “words like *but* cancel implicatures, (...) words like *therefore* signal deductive relationships that may not have been explicitly stated”. From these “salient examples”, could you comment on

the theory of mental spaces and its interface with implicatures or inferences, which are part of implicit communication and invisible meaning (GRICE, 1967, 1975; FAUCCONNIER, 1990)?

GF: Implicature, a notion initially borrowed (and often distorted) by linguists from the philosopher Paul Grice, usually finds its place within a truth-conditional semantics. It is the content, intended by a speaker, that is not part of the explicit truth conditions of the sentence.

This characterization fits into frameworks that sharply separate semantics from pragmatics. But cognitive linguistics does not entertain such a sharp separation. This was evoked in my answer to your first question: “What each of us [*developers of cognitive semantics*] had found, among other things, was that a natural language sentence is cognitively complex, because it gives an array of diverse instructions for building meaning in context. When there are truth conditions, they are the end point of this elaborate mental construction, not its basic and logical starting point.” Langacker¹¹ makes this point as follows: “Certainly an autonomous semantics can be formulated, but the account it offers of the meanings of linguistic expressions is apt to be so restricted and impoverished relative to the full richness of how we actually understand them that one can only question its utility and cognitive reality. Only limited interest attaches to a linguistic semantics that avoids most of the relevant phenomena and leaves recalcitrant data for an ill-defined ‘pragmatic component.’”

The *Martina* example mentioned in the previous answer is a good illustration of the non autonomous nature of semantics. There is no way to assess what its intended meaning is, and whether it is true or not, without bringing in the “invisible” cognitive models and mappings relative to sports competitions, tennis, travel, and so on.

This puts “implicature” in a very different light. Instead of being something that gets added belatedly, it will often be part of the core meaning, what follows from the instructions for meaning construction in a given context. This is true in particular of the “conventional implicatures” you mention in your question. A word like *even* instructs us from the start to find an appropriate scale and an appropriate end point. That’s a central part of the meaning, not something that gets tacked pragmatically onto a core truth-conditional meaning. This is equally true of blends, analogies, and metaphors. We do not process *Money is the root of evil* by finding literal truth conditions for *money* and *root* and then rejecting them because they lead to implausibility. We look directly for the XYZ mapping. With the same syntax, the mapping can be metaphorical as in this case, or it can be simple framing, as in *Paul is the father of Sally*¹².

I noted in the answer to question 3 that force dynamics produced scales to which mental spaces could be linked (*The president may be, and even must be, very honest*). Scales will also appear within mental spaces, and because they are like presuppositions, they will also be

11 Langacker, R. *Foundations of Cognitive Grammar*. Stanford: Stanford University Press. 1987.

12 Fauconnier and Turner (2002, chapter 8).

subject to floating and transfer:

(i) *Even Max can solve this problem.* [Max low point on scale of intelligence]

(ii) *Sally thinks that even Max can solve this problem.* [Max low point on scale of intelligence for speaker and for Sally: the scale is in the base space R and in the subordinate space M of Sally's belief]

(iii) *Sally finds Max stupid, but thinks that even Max can solve this problem.* [Max is a low intelligence point for Sally but not necessarily for the speaker. The scale is in M, but not in the base space R]

(iv) *Sally thinks the problem is super simple, so she thinks that even Max can solve this problem.* [Sally doesn't know Max. The speaker, who has Max as a low point, infers that if the problem is so simple, even Max could solve it]

In (ii) the scale floats up from M to R. In (iii) the scale is part of Sally's belief, but not the speaker's - no floating up. In (iv) The scale is presupposed in R, but not in M - this is a case of transfer. What we find then is that we must build up the mental space configuration on the basis of prior knowledge and discourse, sentence grammar, and plausible defaults. Scalar implicatures are part of the construction and may apply within mental spaces or to the mental spaces themselves (case of the modals).

Blending: power, limits and intersections

ML & JL: Based on the theory of conceptual integration (FAUCONNIER, 1997; FAUCONNIER & TURNER, 2002), what are the restrictions on the application of blending in relation to other cognitive processes, such as the projection of mental spaces? Let us take as a background the discussion held by Harder in 2003. He suggests the following comparison between linguistic constructions to locate simple and complex cases: *black gun* and *fake gun/land animals* and *land yacht*. In the first examples, a property is added to a referent, in the following examples a "contradiction" resolved by manipulating alternatives spaces and blending. In view of these observations, some questions arise: How can we correctly separate simple cases, in which there would be only a projection of the mental space, from complex cases, in which there is blending, as suggested by Harder? What would be the blending limit? Do you consider this a relevant issue for the operationalization of the theory in terms of descriptive economy?

GF: This is an important question. It bears on the notion of descriptive economy and cognitive complexity. And these notions generate many misunderstandings. Let me first say that subjects (i.e. cognitively endowed human speakers of some language) might certainly use shortcuts for processing obvious defaults, treating *black gun* for example as a logical conjunction (black + gun) instead of building a more elaborate mental space configuration.

However, there is more to this than meets the eye. What is “descriptive economy” and when is it desirable? Harder, citing Ockham, writes that “complexities in theoretical assumptions must be motivated by complexities in the data.” But as he himself reports, citing Eve Sweetser, there is nothing wrong with simpler cases also falling out from the general theory – you get them for free. The history of physics attests to this. Ah, but what about the cognitive effort involved? Won’t the supposedly simple cases cost too much effort? As I underscored in my answer to question 4, with the *Martina* example, there is no time difference and no additional cognitive effort for extremely complex operations performed unconsciously in the appropriate context. Just like the theoretical complexity, the apparent cognitive complexity comes for free in an organism that has the blending powers¹³.

OK, but all that does not prove that there isn’t also a more simple mechanism operating alongside conceptual blending. Harder claims that children younger than 4 cannot hold two different pictures in their minds at the same time, so that blending must be a late, complex, acquired skill. The claim is based on children’s conscious answers to experimenters, but those answers have nothing to do with blending, which is attested (unconsciously of course) in children as young as 18 months playing make-believe games.

The really interesting and crucial question is whether mental spaces are theoretically required only for very extreme cases, like the privative adjective *fake*, or whether their role is much more common. And indeed, *fake* was noticed by logicians because it precluded a logical conjunction (*fake* + *gun* $\not\rightarrow$ *gun*). Two clashing mental spaces must be constructed (the victim’s & the actor’s).

Well, many, perhaps all, adjectives can build up counterfactual spaces. Take the adjective *safe*, which conjoins straightforwardly (*safe beach* \rightarrow *safe* + *beach*). To understand *safe beach* in context, elaborate frames and counterfactuals must be built, corresponding to the many possible readings. *Safe* calls up a counterfactual space of danger, with a victim that could be harmed:

victim is the **beach goer** (tourist, her child, his dog, ...), **danger** can be the beach itself (sharp stones, terrain, ...), the water (too deep, rip tides, pollution, ...), what’s in the water (sharks, sting rays, barracudas)

victim is **another** being (seals, turtles, birds) : Seal-lovers think this is a safe beach (because seals are protected)

victim is the beach itself, **danger** could be erosion, overpopulation, building, ...

victim is object on beach, e.g. a building, sandcastles

¹³ This is generally true for neurobiological phenomena: the extraordinary complexity of vision in the brain induces no special cognitive effort under ordinary circumstances.

All this is not just vagueness; the mental spaces correspond to distinct construals and in order to be understood, the speaker must be clear in context about which frames, roles, and mental spaces are relevant. For each reading, a different counterfactual space must come in as an input to the overall conceptual blend. *safe* is a compression of the disanalogy between the counterfactual danger space and reality, where the counterpart of the victim is protected and unharmed¹⁴.

So maybe *safe* is also a very special kind of adjective that triggers complex blends. Well, Peter Harder cites *The Way We Think* in his references, but it's a long book and understandably he did not read it all the way to page 365, where the answer to his question is spelled out in some detail. It turns out that seemingly simple adjectives like *little* and *big* or *black* and *brown* also have hidden layers of complexity that motivate conceptual blends. I will just quote the book directly here rather than summarize or paraphrase:

And brown cows? It's the same story, a story partly told already by Charles Travis for black kettles and green apples. Suppose we are looking at a kettle and Charles Travis¹⁵ says "This kettle is black" and we all agree that it is indeed black. But then Charles wipes the soot off the kettle and we see that it is green, so it isn't black. But is it really green? Charles scrapes off the green paint, and we see that the underlying metal is black, so maybe the kettle is black after all. But now as the sunlight hits it, we see that it is actually dark brown. Charles gives us purple glasses, and now we see that the kettle is black. The moral of this first part of Travis's story is that there is no absolute sense in which the property black applies to the kettle or not. Particular circumstances and contextual presuppositions make it appropriate or inappropriate to call the kettle black.

The second part of the story is that we can call the kettle black if it has a black decorative design; if it has a black spot while all the other kettles have green spots; if it is one of two identical kettles with no black color on their surfaces and it is on the black oven instead of the white one; if it is the one that came in the black box; if it was manufactured by a company owned entirely by blacks; and so on. Each time "black" is used in these cases, we feel that it is indicating a Property of a kettle. And at the same time, we see from the examples above that there is no such stable property in any absolute sense that could be defined for the kettle once and for all independently of anything else. How can this be? The answer is that "black" is like the other adjectives we saw. It prompts for an integration network and compresses some outer-space relations into the inner-space Property black in the blend.

Note that we focus exclusively on cases where it seems that the color black has been assigned literally to an element, and not on metaphoric or metonymic uses such as "black magic" or "black arts". In what looks like strict color assignment, "black" followed by a noun

14 See *The Way We Think*, chap. 17, pp.353-365.

15 Travis, C. *The True and the False: The Domain of the Pragmatic*. Amsterdam: John Benjamins. 1981.

prompts for a mapping scheme in which one space has colors (in particular, the color black) and the other space has the element picked out by the noun. We are to find a cross-space mapping between the color black and something salient in the other space. Typically, the noun might pick out an object one of whose visible parts has a color that is close to black. In the integration network, that color is mapped onto the color black in the space of basic colors. By selective projection, only the color black from the color input is projected to the blend, while the object and its environment are projected from the other input. Thus, in the blend, the object itself has the Property black to the exclusion of any other colors. And as the black spot example shows, this is possible regardless of the actual objective amount of other colors on the object.

But parts of an object are only one kind of salient aspect of an element in a space. As the oven example shows, what it is sitting on can be salient. Similarly, what it contains can be salient (a red cup containing black paint can be a “black cup” next to a red cup containing white paint). Also, the producer of the object can be salient, so the kettle produced by blacks can be the “black kettle.” But the element in the space evoked by the noun does not have to be a prototypical object. We can refer to a “black sky” where “black sky” can mean that a few ominous clouds are dark enough to be mapped onto black in the basic color space.

As we see, color adjectives prompt for specific complex integration networks in which outer-space connections correspond to color Properties in the blend. [The Way We Think, pages 363-364].

So we see that there is far more blending than one might think. The syntactic simplicity of Adj. N does not translate into transparent semantic simplicity. It is true, as many, including Harder, have noted that there are simple-looking logical accounts of “*black kettle*”, but Travis’ work and the excerpt above show that such accounts are inadequate.

Again, let me stress that far from a lack of descriptive economy, this is a standard case of greater descriptive economy (conceptual blending applies in all cases). Should we deplore that this adds complexity? No, the complexity is really there, and blending is an elegant, uniform way to deal with it. Is it implausible that children would learn it and master it? Absolutely not; here I will also cite from previous work:

In the early days of contemporary linguistics, the realization that children mastered stunningly complex syntactic and phonological structures was often met with disbelief: how could toddlers possibly know so much? We know better today: the child’s cognitive brain leaves in the dust our most powerful computers. So there is nothing surprising in the discovery that meaning construction is also supported and effected by highly elaborate dynamic systems. The challenge for the analyst is to delve rigorously into these remarkable constructions of the mind ¹⁶.

16 Fauconnier & Turner. Rethinking Metaphor. In.: Ray Gibbs, ed. *Cambridge Handbook of Metaphor and Thought*. Cambridge University Press. 2008.

Blending and conceptual metaphor

ML & JL: We know that the blending theory and the conceptual metaphor theory (LAKOFF & JOHNSON, 1980) are not competing alternatives. So much so; that blending allows us to verify that certain patterns of metaphorical inference, in mapping between a source and a target domain, depend on conceptual compressions and selective projections for an efficient inference (FAUCONNIER & TURNER, 2008). This brings together the two semantic-cognitive processes, but certainly does not make them equivalent. How do you see the interactions between metaphor and conceptual blending in the construction of the meaning? What are the limits and intersections?

GF: As already evoked in the response to question 1, it was difficult to bring the study of meaning into generative linguistics, centered on autonomous syntax. Bringing metaphor into the picture met with even more resistance. In the period before 1980, there was deep hostility to any serious consideration of metaphor, both within linguistics and within analytic and ordinary language philosophy. Metaphor was a figure of speech, a concern for literature and poetics only, and not to be confused with core meaning. I remember walking on the grounds of Royaumont with N. Chomsky in 1981, and bringing up the topic of metaphor; he became angry and called any such talk incoherent and unworthy of scientific attention. Philosophers like Searle or Davidson were equally dismissive, while showing little understanding or awareness of the depth of metaphor in everyday language.

Lakoff and Johnson¹⁷ succeeded brilliantly in bringing metaphor to center stage in the study of meaning. What they showed was that basic metaphors with elaborate source and target domains were at the heart of fundamental natural language semantics, so deeply

entrenched that we take them for granted, do not even notice that they are metaphors, and yet could not think and talk without them. Following that seminal work, the contemporary theory of metaphor was born, with a major emphasis on finding and describing metaphors that are inherently part of a language. Included in such descriptions are the source and target domains of the metaphor, with their counterpart structure, system of transferred inferences, projection of structure from the source domain to the target domain. Studies of metaphorical systems have been carried out for many languages.

Metaphor draws its power from conceptual and analogical thought, not from truth-conditional logic. And so it fits in well with cognitive semantics, but not with formal semantics, and its importance and centrality for meaning construction is yet another strong motivation for the cognitive approach.

Conceptual blending looks at the construction of discourse, where blends are formed

17 Lakoff & Johnson. *Metaphors We Live By*. Chicago: University of Chicago Press. 1980.

through cross-space mapping, selective projection to a new blended mental space, and completion, composition, and elaboration. Metaphor includes cross-domain mapping which can feed a cross-space mapping in some discourse. Selective projection from the two spaces will set up the blended space, which in turn can have emergent structure applicable to the discourse. So metaphor in discourse will take the form of a blend. Turner and I¹⁸ noted that simple unidirectional metaphors were single scope blends, for example the case of two business competitors framed metaphorically as boxers fighting each other. But then we pointed out that many metaphors gave rise to double-scope networks, for example “digging your own grave”, where the blended space has projections from both inputs and develops its own emergent structure, distinct from what would be called source and target in standard CMT. Furthermore, metaphors and metonymies can combine to give a “multiple blend” (a network with several inputs), as in the metaphors for anger, originally analyzed perspicuously by Kövecses and Lakoff. The emergent structures in such cases would not be available in the CMT source/target model, for example “*he was so mad I could see smoke coming out of his ears*”.

An important finding, sharply at odds with the original metaphor theory, is that metaphor can be set up to borrow an existing compression in one input (the “source” in the CMT model), while getting key inferences from another input, so that the blended space actually clashes with the “source” input. Take for instance examples like

Is a snoring partner driving you to an early grave?

There are three inputs:

- 1) graves, dying, funerals , ...
- 2) pushing into a container (hole? cave?)
- 3) human behavior makes life shorter

Two compressions are borrowed:

- familiar scenario of graves/death
- pushing something to speed it up

The crucial inference (partner dies earlier because of painful snoring) comes from input 2), pushing someone to speed them up, not from input 1) (the “source”): in 1), people are not pushed alive into graves, in which they die; rather, they die first, and then are buried. In such examples, the compression (scenario of dying and funerals) is borrowed, but not the inferential structure that normally goes with it.

In later work¹⁹, we explored what we think are deeper aspects of metaphorical meaning

18 See *The Way We Think*.

19 *Rethinking metaphor*. op.cit.

construction. We looked at the familiar “TIME as SPACE” metaphor, usually thought of very simply as a case of SOURCE(SPACE)-TARGET(TIME), and by bringing in considerable additional data, such as *Those three hours went by slowly*, *Time stood still*, *Where have all those years disappeared?*, we showed that the network for “time” actually contained many mental spaces and blended mental spaces (fourteen in our proposal). Time in this network is not a primitive input, but rather a notion that emerges from the full network.

So, to answer your question, we see that blending theory incorporates insights of CMT, but also extends them or modifies them significantly to produce a different theoretical perspective.

Of course, as for the previous question about the limits of blending, one might object in the spirit of Harder that we are making everything unnecessarily complex. My answer would be similar: the data is really far more complex and interesting than standard examples might suggest, and the child’s brain is admirably equipped to deal this apparent complexity, hidden as usual from consciousness.

Metonymy

ML & JL: How do compressions generate metonymy? Could you comment on this connection between compression and metonymy with linguistic examples?

GF: Labels like “metaphor” and “metonymy” are quite superficial. When we pursue the analysis in greater depth, we find that such labels cover a variety of different cases. This point was made for “metaphor” in the answer to the previous question. The same is true of “metonymy.” A dictionary definition tells us:

‘**Metonymy**’ is when something is used to represent something related to it.

Analysis reveals a variety of cases, some of which involve blending and compression and some which do not.

Nunberg’s pragmatic functions allow the Access Principle to operate. So in a restaurant setting, dishes ordered are mapped onto customers, and the dish can identify the customer. There is no blending as shown by the unacceptable reflexive in (iv)²⁰:

(i) *The ham sandwich left a tip.* (= customer)

(ii) *The ham sandwich wants it with mayonnaise.* (= customer, it = sandwich)

(iii) *The ham sandwich excused himself.* (= customer)

(iv) **The ham sandwich wants itself with onions.*

On the other hand, in a context of driving on the freeway, the car and its driver can blend

²⁰ As before, * indicate unacceptability.

(through compression into uniqueness):

(i) *The blue car decided to park itself beside me.* (= driver, itself = car)

(ii) *The driver decided to park himself in front of me.* (himself = car)

(iii) *The blue car was furious and crashed into the wall.* (= driver, car)

Now there are also cases where the compression is to identity, but not uniqueness.

(i) *I saw myself in the picture.*

The picture mental space blends with reality. “I” in reality and its counterpart “I” in the picture are projected into the blended space as separate but identical elements. This is similar to what happens in the Buddhist Monk (the monk meets himself), but superficially we have metonymy of the Nunberg/Jackendoff variety, because “I” in reality can access its image.

Certain very tight pragmatic functions allow this compression to identity without uniqueness, for example books and authors:

Chomsky found himself on the top shelf. (= author, himself = books)

Compare with the unacceptable:

* *The ham sandwich found itself on the counter.*

The connection here between sandwiches and customers is ephemeral, in contrast to the tight connection between authors and their books. The books are “part” of the authors, they “represent” the authors, the author is the book, and so forth.

Now, blending with compression allows interesting interaction with metaphor. Take *John Smith is in the phone book*. This is a standard metonymy, it would seem, where *John Smith* identifies a person, and that person (in discourse) can be used to access its name listed in the phone book. Furthermore, this is a case of tight connection: *John Smith found himself in the phone book*. The inputs to the blend are the mental spaces of reality and the phone book.

In the blended space, the phone book is a region and the person (like the buddhist monk) can be in two places at once, outside of the region as a “real person” and inside the region as one of the people who inhabit the phone book. Superficially this is a metaphor which can be extended straightforwardly. Instead of the phone book, take the *Who’s Who*, which lists famous or important people, and in which some may find it desirable to be listed:

John Smith made it into Who’s Who.

After trying for many years, John Smith finally got into Who’s Who.

As you can see, in the blended space, John Smith very much wants to get into the region

“Who’s Who”. This is still the same metonymy as before, but now it also feels metaphorical, because the mental space “Who’s Who” is a metaphorical input to the blend. There is a third (source) input here, the familiar notion of moving in physical space from one region to another. “Who’s Who” is very much like “the picture” in examples above:

John found himself in the picture.

John badly wants to be in the picture.

The case of authors and books also lends itself to this metaphorical extension, as show by the following statement (attributed in some form to Mark Twain): *Jane Austen will never get into my library* meaning of course that he would have none of Austen’s books in his library.

The tennis example discussed in the answer to question 4 illustrates other aspects of compression generating what appears on the surface to be straightforward metonymy:

Martina is three points away from the airport.

“*the airport*” stands for something else: losing the match, being eliminated, and going home. As I mentioned before, there is a long, complex, causal chain here that gets drastically compressed in the sentence itself. But being at the end of such a causal chain is not quite the same as being a full metonymy. Consider the following:

(i) *Losing would be a disaster for Martina.*

(ii) * *The airport would be a disaster for Martina.*

the airport cannot substitute for losing or going home or being eliminated.

(iii) *Svetlana is an inch away from the podium.*

Svetlana is a high jumper, and if she can jump one inch higher, she will be in the top three, and therefore stand on the podium in the final ceremony. *the podium*, just like *the airport*, is a compression of a causal chain, <jumping higher —> being in the top three —> standing on the podium>. But this time, it can work as a full metonymy:

(iv) *The podium* would mean a lot to Svetlana. (finishing in the top 3 would mean a lot to her) *the podium* is entrenched as a goal signifying success within the frame of sports competition. *the airport* does not take on the equivalent meaning of failure within the tennis tournament frame, even though it is used to signal the causal compression of losing and its consequences. Presumably, this is because airports are not in themselves part of the sports competition frame (as opposed to podiums). All these cases are quite subtle, and they show the slippery nature of the notion of metonymy.

Superficial classifications of common metonymies can be reevaluated in more depth by looking at their underlying compression characteristics:

THE PART FOR THE WHOLE

The Giants need *a stronger arm* in left field. [compression of **part-whole** to **category**]

PRODUCER FOR PRODUCT

He's got *a Picasso*. [**cause-effect** compressed to **category**]

I love to read *Tolstoi*. [compression to **identity**]

OBJECT USED FOR USER

The buses are on strike. [compression to **uniqueness**]

The buses gave themselves one more day to vote on ending the strike.

CONTROLLER FOR CONTROLLED

Truman bombed Japan. [causal compression]

A Humvee rear-ended *me*. [integration to **uniqueness**]

THE PLACE FOR THE INSTITUTION

The White House isn't saying anything. [Access Principle (no compression)]

Wall Street is in a panic.

Washington is insensitive to the needs of the people.

THE PLACE FOR THE EVENT

Pearl Harbor still has an effect on our foreign policy. [Access Principle (no compression)]

Watergate changed our politics.

Within the elaborate network of blends that give rise to the notion of time, we find another widespread way for something to stand for something else (superficial metonymy):

That stretch of road went by effortlessly.

The last hour took forever.

The first five miles went by with little effort.

These cases are actually metaphorical compressions of event to spatial motion, and mapping of spatial motion to space and distance.

Finally, here is a splendid example of causal compression in a story by Stefan Zweig²¹ that I happened to be reading last week. In the story, entitled *Fear*, the heroine, Irene, has decided to commit suicide, and she is at the pharmacy where a chemist fills a prescription of hers for a deadly substance. She watches (spellbound) as the chemist pours the substance into a small blue phial from a “bulging round container.” And so, as we are told in the story:

Transfixed, she watched death finding its way from the container into the phial. From there it would soon be flowing through her veins.

As in the Martina example, a long causal sequence needs to be reconstructed: **drops** of the liquid from the container are measured into the phial → Irene takes the phial home → she drinks all the liquid in the phial → the liquid enters her body and then her blood → it flows with the blood inside her veins → this causes **death**.

The long **cause-effect** connection of the liquid to death is compressed into **uniqueness**: the **liquid** slowly dropping into the phial IS **death**. But there is more. Given this compression, a metaphorical blend can be (and is) added to the meaning construction. Death is personified, as in so many tales of death: it **finds its way**, first into the phial, then into the veins, where Death causes death.

So Death is trying to make its way from the chemist’s counter to Irene’s phial, Irene’s house, and finally Irene’s body. **Intentionality** has been added to this spectacular blend. Of course, it is all in Irene’s mind, and then in the reader’s. The chemist is unaware of any of this. Interestingly, a few pages earlier in the story, Irene finds the needed prescription in a drawer, and is happy. We are told that ...

...With a smile, she folded the prescription as though it were a precious banknote: now she held death in her hand.

The prescription is now the starting point of the causal chain that will lead to filling the phial and ultimately to **death**. Again, we have compression to uniqueness, so that Irene can “*hold death in her hand*”. Interestingly, she now has control over death (in her hand) and she is pleased. Death is not yet personified at that point. Later, transfixed at the pharmacy, she sees the poured liquid of death as malevolent and intentionally out to get her. She has lost control.

Blending: methodological criticisms, epistemology and the future of theory

ML & JL: The theory of conceptual integration has been the subject of reflection on its methodological and empirical aspects. We would particularly like to briefly approach Gibbs (2000). Your reflections lead us to the following points: i. the blending limit, ii. the possibility of falsifying hypotheses (POPPER, 1959), iii. the possibility of making predictions - previous

21 Stefan Zweig. *Fear*. In.: Zweig, Stefan. *The Royal Game and Other Stories*. Penguin Books.1984

statements for later verification - “according to the hypothetical-deductive method of scientific inference” (GIBBS, 2000, p.349-350) - and the level of realism of the interpretations attributed to the speaker. We would like you to address the methodological aspects of your work, your view of science, your position in relation to critical comments against blending.

GF: The article you refer to, Gibbs (2000), offers a remarkably simple-minded view of science! It brings up several interesting issues, but frames them in highly misguided ways. Let’s start with the following statement in the article: “psychologists, like most scientists, favor hypotheses that lead to specific experimental predictions.” He goes on to say that psychologists complain that cognitive linguistics does not have this feature. Hence psychologists are real scientists, but not cognitive linguists.

Let’s first correct the statement factually. Experiments are a wonderful part of science, and of physics in particular, but that is not the only way (or even the main way) that science is done. Gathering vast amounts of data is crucial if you are a geologist, an astrophysicist, or a biologist. On the basis of such data, scientists do their best to develop an account that has explanatory power, by virtue of its generality, elegance, optimality, connection to other scientific knowledge. If experiments can be devised and added, to evaluate the explanation, so much the better. Scientists who specialize in particular domains and subdomains become of course familiar with huge amounts of data, gathered throughout the ages and in their own time by colleagues, and themselves, and others who make a remarkable discovery, such as a rare fossil, or prehistoric art, or an unknown species. So, are the efforts of such scientists predictive (even in the absence of experiments)? Absolutely; they make the extremely strong prediction that whatever data may be discovered will fit neatly into the account (the theory) that they have proposed. Now of course, in science, theories and even whole paradigms, are replaced all the time under pressure from novel data, or more appealing theories (from some viewpoint or *Zeitgeist* - e.g. Copernicus vs. epicycles). Scientists operating within the scheme of science have many duties and constraints placed upon them. They must be perpetually on the lookout for additional data that can be obtained through observation or experimentation (which is a way of creating new data that has special relevance). And they must then evaluate existing accounts to see if they hold up under the additional data, or whether they are falsified by it. If the new facts do not fit the old theory, then efforts will get underway to find a better account (or sometimes to reinterpret the observations in an effort to maintain the theory). This is the ground upon which the battles of science are fought.

Linguistics of all stripes has a solid scientific tradition of this nature. Huge amounts of data are collected, analyzed, and submitted to rigorous analysis. Take the example of **Grimm’s law**, establishing a set of regular correspondences between early Germanic stops, fricatives and the stop consonants of certain other centum Indo-European languages, using mostly Latin and Greek for illustration. Notice that no experiments were (or could be involved), and yet this is a remarkable part of the foundations of modern scientific linguistics. Does research of this kind

lead to predictions, in addition to its explanatory power? It certainly does and the predictions can be spectacular. Saussure developed his laryngeal theory, based on observation and generalization of known indo-european languages. Much later, Hittite texts on clay tablets were discovered, showing explicitly the laryngeals predicted by Saussure for Proto-Indo-European, and also establishing that Hittite was Indo-European. As in geology, anthropology, astrophysics, and in fact science in general, crucial theory was developed through extensive observation.

Gibbs does not seem aware of any of this, and mistakenly calls research of this nature **post-hoc**. But post-hoc means something different, namely “the fallacy where we believe that because one event follows another, the first must have been a cause of the second.” Gibbs seems to think that post-hoc means analyses produced after observation of data, rather than through experiments. Well, for one thing, such analyses are not post-hoc, and for another, there is nothing wrong with them: they are the bedrock of science.

The work on blending fits solidly within this ageless scientific method of seeking the most general explanation for the maximum amount of known facts. It involves discovering new data, understanding its relation to previously known data, showing that it’s not handled satisfactorily (or at all) by existing theories and proposing accounts that will subsume all the data (new and old).

And incidentally, this is exactly the way blending theory developed and evolved. Turner and I first came upon cases of metaphor that did not fit the standard source-target model, and we initially conceived a simple blending model that would fare better. But this immediately led us to look for other cases that might require such models. And suddenly it turned out that there was a deluge of such data. At the beginning, only the most noticeable cases were invoked (the buddhist monk, the debate with Kant, the regatta, imaginary numbers ...) But that in turn led to looking at more familiar data (e.g. counterfactuals) from this novel perspective, which revealed the possibility (and desirability) of a far more inclusive explanatory theory, with multiple blends, optimality principles, and so forth.

What else does Gibbs have to say about science? Well, he sanctimoniously invokes the Popperian creed that any account must be “falsifiable”. Then he suggests that blending is not yet clearly falsifiable, but then he concedes at the same time that frameworks are not falsifiable in themselves, only particular hypotheses within frameworks. Gibbs is not familiar with much recent philosophy of science, showing the limits of falsifiability. In fact, Popper himself came to the conclusion that his falsifiability criterion would not work for geology or astronomy. And that it would not work for evolutionary biology either, which led Popper to write that “Darwinian evolutionary theory failed to satisfy that criterion so it was not a scientific theory but only a metaphysical research programme”.

The real question that Gibbs should be asking is: can frameworks be improved to deal with novel data, and can frameworks be abandoned in the face of challenging evidence? Blending

did not falsify metaphor theory; rather it showed that considerable additional data existed that could be handled by an improved framework, namely conceptual integration. That framework has been improved and modified significantly over the years, for instance by recognizing the key operations of compression. The equivalent of Popper's famed falsifiability is really the following: a wide range of data can be analyzed within the blending framework, but in principle other data might be found that contradict principles of this framework and demand either an improvement or a replacement. What happened with metaphor theory illustrates exactly this type of evolution. Just as we found data supporting a revision and extension of the initial metaphor theory, it is up to everyone to look for such data (linguistic or not) with respect to possible improvements (or replacements - God forbid) of blending theory, or indeed to simply reanalyze existing data in a more perspicuous way.

Now there is some confusion in the article by Gibbs. He starts out by giving examples of complex metaphors that require blending theory, and he rejoices that blending has come along, since "no psychological model could come close to capturing what people may do to comprehend [such cases]". But then he seems to chide blending for not explicitly formulating reasonable alternatives for empirical examination. But then he writes (in seeming contradiction with what just precedes) that "blending theory is far more comprehensive in the scope of meaning constructions it can explain, and has indeed shown that it is a more satisfactory account than several alternative theories for different linguistic phenomena (e.g. counterfactuals)".

All this confusion really comes from the fact that Gibbs, as a psychologist, is interested in the very legitimate issue of real time processing. His work on metaphor for example addressed a genuine empirical issue: are some observed metaphors of everyday language just dead metaphors processed as single chunks of meaning, or do subjects actually activate source and target domains in producing or understanding such expressions? I suspect that Gibbs would like to do the same for blending, and see to what extent the theoretical account fits with real time processing.

This is a good project, and it is a project for psychologists like Gibbs to work on. But there are difficulties. Gibbs asks: "must people actually create complex blended spaces to understand what speakers intend by the expression John is digging his own grave?" Notice that there is some overlap here with your question no. 6 and Harder's objection. But Gibbs is explicitly concerned with psychological processing, and he seems to think that blending is unduly complex.

Part of my answer is the same as for Harder, namely that once blending is available to the brain, it is done effortlessly. But in itself, this still doesn't show that, easy or not, it's actually what's happening. How can the psychologist tell? The main tool at the psychologist's disposal is the idea that more complexity correlates with greater cognitive effort, that can then be measured experimentally. But in fact this key assumption is unwarranted in the case of blending and compression, or for that matter in the case of vision or motion. As noted earlier

in this interview for the Martina example and others like it, if the context is clear and totally familiar to the “subject”, a very long and complex causal chain can apparently be constructed on the fly effortlessly. On the other hand, out of context, subjects are not even able to guess the meaning of the Martina example: there is cognitive effort but no result.

Given all this, we need to dig deeper. If cognitive science were as advanced as modern physics, there would be processing models all the way to the neural level and experimental procedures for confirming (or falsifying) such models. We have nothing remotely that precise, and so psychology is forced to operate at an intermediate level.

What I find bizarre is that Gibbs seems to blame blending theory for the difficulties with making or checking claims about processing. But as I stressed earlier, and as Gibbs himself acknowledges, blending has followed rigorous scientific steps in building and motivating its account. It is really up to the psychologist to follow this up with clever tests for processing, just as Gibbs and others (Boroditsky²²) did for metaphor. Gibbs is a psychologist with much sympathy for linguistic work and thinks that there is a need for blending scholars to “gain the attention and respect of psychologists.” This goes both ways. Linguists in the past have not seen psychology as immensely helpful²³. Cognitive linguists on the other hand have shown an exceptional willingness to collaborate with psychologists.

Future

ML & JL: What developments and potentialities of the theory of conceptual integration do you *project* today? And what are your current research interests?

GF: It is remarkably hard (without a crystal ball) to predict or even just to project developments and potentialities of any research program. If I had been asked about the future of mental spaces in 1992, there would have been no mention of conceptual integration and blending, even though a year later that was a major turning point. Asked about the future of blending research in 1999, I would not have answered “compression”, even though that was in fact the next big step. What I can note today is that there is a considerable amount of work underway, which goes far beyond linguistics and extends to a wide array of different domains. Much of that work, or references to it, can be accessed online through **mentalspace.net** (—> BLENDED SPACES).

There is of course in that list a great deal of research in cognitive linguistics, especially semantics, and the conceptualization of time as in Piata (2013), Pagán Cánovas & Teuscher (2013), Coulson & Pagán Cánovas (2013), Aparta. Also work on grammatical constructions,

²² Boroditsky, L. Metaphoric structuring: Understanding time through spatial metaphors. *Cognition*, 75(1), 1-27. 2000.

²³ Chomsky highlighted shortcomings of psychology’s approach to language in his review of Skinner’s *Verbal Behavior*. Formal semantics and generative syntax have paid little attention to psychology.

metaphor, image schemas (*Image Schema Combinations and Complex Events* 2019), counterfactuals, prosody, and I expect that all this work will go on and keep on yielding fruitful results.

Then there is substantial blending work in computational modeling and creative systems, as in *Concept Invention* 2018, and the COINVENT project (Future and Emerging technologies), neural networks. Research of this type into the nature of creativity and modeling of conceptual integration and creative processes will certainly persist and flourish. I look forward to advances in the modeling of compression and emergent structure.

The mental space and blending framework has been useful, and hopefully will continue to be so, in the study of specific fields. Music is one, as in Antovic' 2018 (emergence of musical concepts through conceptual blending) and Arndt 2017. Mathematics is another, following my early work on complex (imaginary) numbers (with Turner), and Lakoff and Núñez's explanation of the evolution of many mathematical ideas through conceptual blending. See Alexander 2011 (*Blending in Mathematics*), Bing & Redish 2007 (*The cognitive blending of mathematics and physics knowledge*). Then there have also been fascinating studies that fall into literature, philosophy, theology, recent ones being Bonifazi 2018, Gomola 2018 (early Christian discourse), Budelmann & LeVen (2014), Cánovas & Jensen 2013 (Timeline in poetic metaphors), Cook 2010 (Shakespeare). Much more will undoubtedly be done in such areas. Film and art also lend themselves to brilliant work, as in Morley (2016), Rubba (2009).

Outstanding research on sign language (Liddell, 2003) and anthropology (Sorensen 2006 - *A Cognitive Theory of Magic*) deserve to be pursued, extended, and explained further to practitioners in these fields.

All these directions (and a few others, for example multimedia, gesture, and design) have started to be explored from a mental space and blending perspective, and so we can expect developments in each one. But of course (and even better) some unforeseen potentialities may be discovered and lead elsewhere.

As to my own current interests, I continue to work in linguistics and semantics, broadly conceived (Fauconnier, 2018), with continuing interest in finding out more about compression (Fauconnier, 2013). Very generally, I believe, as stated in some of my answers in this²⁴ interview, that language in context expresses far more than is visible in the words and syntax. I have suggested that much of meaning was largely hidden (invisible) and I have called this "the dark matter of semantics". Understanding this extraordinary aspect of human communication²⁵ and conceptualization will require far greater attention and analysis than it has received so far. I have some other projects as well, pursuing cognitive-mathematical work on Gödel and Cantor

24 Fauconnier, Gilles. *Mysteries of Meaning Construction. Proceedings of the Japanese Cognitive Linguistics Association*. 2013.

25 Plenary lecture. *The Dark Matter of Semantics. 4th UK Cognitive Linguistics Conference*, King's College, London. 2012.

that I started a while ago, and also showing the nature of philosophical paradoxes, such as the Liar, or Curry's paradox, when seen from a mental space, discourse-building perspective.

Thank you for the generosity of your answers, Fauconnier!

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