Chapter 1
Mappings

This book explores a simple idea: that mappings\(^1\) between domains are at the heart of the unique human cognitive faculty of producing, transferring, and processing meaning.

Although simple, this idea is powerful in two ways. It yields general procedures and principles for a wide array of meaning and reasoning phenomena, including conceptual projection, conceptual integration and blending, analogy, reference, and counterfactuals; and it provides us with insights about the organization of cognitive domains to which we have no direct access.

This book deals with the evidence for mappings and underlying domains offered by language structure and use. It is meant to be part of a more general cognitive enterprise that takes into account cultural and sociological models, learning, psychological development, and neurobiological mappings.

Throughout this study meaning construction refers to the high-level, complex mental operations that apply within and across domains when we think, act, or communicate. The domains are also mental, and they include background cognitive and conceptual models as well as locally introduced mental spaces, which have only partial structure. It has been a major goal of cognitive linguistics to specify meaning construction, its operations, its domains, and how they are reflected in language. Research on these matters is progressing rapidly, uncovering the intricate schemas behind everyday grammar, the richness of underlying conceptual systems, and the complexity of mental space configurations in ordinary discourse.\(^2\) A recurrent finding has been that visible language is only the tip of the iceberg of invisible meaning construction that goes on as we think and talk. This hidden, backstage cognition defines our

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1. A mapping, in the most general mathematical sense, is a correspondence between two sets that assigns to each element in the first a counterpart in the second.

mental and social life. Language is one of its prominent external manifestations.

Meaning construction is a cornerstone of cognitive science. This section briefly reviews some of the reasons why and outlines goals, assumptions, and findings of the new approaches.

1. The Importance and Relevance of Meaning Construction

Scientific inquiry typically starts with the outside world—the stars, the planets, the elements—before extending to the human world—the body, the brain, the mind, society. In the development of science as we know it, physics and chemistry preceded biology, which itself is more advanced from a technical and operational point of view than, say, cognitive science or sociology. The paradox that we know more about faraway galaxies than we do about the core of our own planet has a cognitive analogue. We seem to know a good deal more about the world around us than we do about our minds and brains.

Science proceeds indirectly; it correlates surface phenomena by interpreting them in certain ways at the observational level and hypothesizing deeper, and more general, relations and principles underlying the phenomena. Our knowledge of the universe is indirect in just this way: We infer a rich and complex structure on the basis of very partial and impoverished data (e.g., signals obtained with some hardship and considerable technical sophistication). Cognitive science is no different. Although brains are physically close and accessible, most of what we can guess about their organization, at the fundamental neurobiological level, or at somewhat more abstract levels of cognition, is apprehended indirectly, by observing various kinds of input and output.

In the case of the human mind/brain, one type of signal is especially pervasive and freely accessible, and that is language. Because we know language to be intimately connected to some important mental processes, we have in principle a rich, virtually inexhaustible source of data to investigate some aspects of mental processes. So, we must apply our scientific imagination and rational deduction to language signals in the same way that astrophysicists exploit the information they glean from infrared radiation or gamma rays.

But there is a hitch. In studying supernovas or neutrinos, the phenomena, the theories, and our reflections on them are kept apart with relative ease. For language and thought this is not the case: We produce our account of the phenomena under study by using language and thought, that is, by relying on the very phenomenon we are studying. And to make matters worse, the stars and the telescope are confounded: Can language and thought be the instruments for analyzing themselves? The twist of this particular scientific endeavor is that, as human beings immersed in everyday life, we have a rich array of notions (folk-theoretic, one might say) about what we say and what we think, which although in one sense are quite useful, are also in another sense quite wrong and will easily get in the way of our scientific investigation.

Another scientific challenge is to make apparent the extraordinary mystery of language. I have compared language signals coming from the mind/brain to signals received from distant galaxies, or from infinitesimal atoms, that would enable us to make conjectures as to the hidden structures and organizational principles that we cannot apprehend directly. In the case of physics, such signals are typically obtained by means of advanced technology. In today's world, people with no particular interest in astrophysics or quantum mechanics recognize this kind of observation as a significant accomplishment. The fact that we nonspecialists do not understand the techniques in detail, or at all, actually adds to the mystery and (correctly) strengthens our sense that something deep is going on. Brain scanners, which light up multicolored screens, are equally impressive. The same cannot be said of language signals: There is a steady flow of talk in the world, and it looks very easily available indeed. What is more, people who study language signals happen, because they are human, to come biologically endowed with very good technology for receiving and processing such signals. But this technical prowess will not immediately impress other human beings.
who are equally gifted for this particular technology and are admirably equipped to use the received signals to produce rich mental constructions with such ease that the entire process does not seem to them especially complicated or mysterious.

I take it, then, that although language data, a richly structured signal emanating from the mind/brain, is in plentiful supply, it is often underestimated scientifically and socially as a source of deeper insight into the human mind.

But isn’t such a claim farfetched? Language, after all, has received considerable attention from grammarians, rhetoricians, linguists, philosophers, psychologists, legal scholars, communication experts, and many others. There has been great progress in understanding its structural complexity, in tracking down its semantic and pragmatic subtleties, and in linking its manifestations to other forms of human behavior.

This is true, but if language data is a signal operating on less accessible cognitive constructions, then it is fair to say that linguistic research has focused on the structure of the signal itself rather than on the nonlinguistic constructions to which the signal is connected. Which is fine, as far as it goes: The signal must be understood if we wish to use it inductively to infer its domain of application. But it is equally true that, even if one is only interested in the signal itself, the domain of application and the signal’s function are crucially relevant. And it is also fair to say that nonlinguistic research has paid little attention to the basic nature of meaning constructions and their subtle and principled links to syntactic form.

Modern linguistics, structuralist or generative, has treated language as an autonomous object of study. It has not been concerned with using language data within the larger project envisioned here: gaining access to the rich meaning constructions upon which language operates.

In philosophy, on the other hand, there has been awareness that language organization could reveal more than its own structural principles, and many interesting issues have been raised. Many of us find the problems fascinating yet remain disappointed by the results. We think that the range of data examined is insufficient and improperly selected, and that the range of interesting hypotheses is usually severely constrained by a priori theoretical assumptions, which receive little explicit

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attention. We see this as a source of circularity, as the assumptions in question are in fact in themselves an important target of the investigation.

A related shortcoming of modern work, found in this case both in linguistics and in philosophy, is the sharp emphasis on separating components (e.g., syntactic, semantic, pragmatic) and attempting to study the grammatical or meaning structure of expressions independently of their function in building up discourse, and independency of their use in reasoning and communication. In fact, discourse configurations are highly organized and complex within wider social and cultural contexts, and the raison d’être of grammatical constructions and words within them is to provide us with (imperfect) clues as to what discourse configurations to set up. A major finding of cognitive semantics and mental-space research is that the same mapping operations and principles are at work in elementary semantics, pragmatics, and so-called higher-level reasoning. The analysis of tense, reference, presupposition, and counterfactuals is intimately tied to that of analogical mappings, conceptual connections, and discourse construction, which in turn is inseparable from the understanding of metaphor and metonymy, narrative structure, speech acts, rhetoric, and general reasoning.

2. Goals and Techniques

2.1. Structures and Data

Why is meaning construction an important field of inquiry, and why should we hope to have better luck with it now than in the past? I suggested above, with respect to the first question, that in spite of much language-related research, language data remained underestimated and underexploited as a unique and amazing source of information for reconstructing deeper cognitive processes. But this broad observation remains useless unless we come up with a positive answer to the second question. Are we today in a better position to use available data (the language “signals”) for the purpose of discovering inferentially some of the hidden cognitive processes at work? Let us look at some signs of hope.

First, the level of scientific sophistication in modern linguistics is impressive. To quote the philosopher Hilary Putnam: “Language is the first broad area of human cognitive capacity for which we are beginning
to obtain a description which is not exaggeratedly oversimplified. Thanks to the work of contemporary transformational linguists, a very subtle description of at least some human languages is in the process of being constructed.

This is perhaps most evident in phonology, where very abstract and elegant theories are emerging. In syntax and areas of semantics and pragmatics the field is more disparate, but the scientific methodology is there, even if the foundations are still shaky. Huge amounts of data are submitted to intensive investigation, abstract universal principles of explanation are sought for in the best scientific tradition, and sophisticated argumentation strategies are marshaled in support of theoretical standpoints. As was pointed out in the previous section, this excellent scientific methodology is for the time being very strongly directed at the internal structure of language viewed as an autonomous object of inquiry, rather than at the richer cognitive constructions that language use helps to target. There is no reason why the same rigor, thoroughness, and imaginative invention should not be applied to the broader issue.

This is already the case in many respects. Theoretical research on language has followed a curious path in the last twenty years. The emphasis on studying structure for its own sake and independently of meaning and use, inherited from twentieth-century structuralism, was preserved in principle within the transformational, generative, or relational approaches; but, oddly enough, this structuralist dogma opened the door to wide-scale research in semantics and pragmatics. The reason is this. Luckily for those of us interested in meaning, the strong version of the autonomy of linguistic form happens to be wrong for natural language; judgments of grammaticality and acceptability are dependent to various degrees on many features linked to context, meaning, and use. This important property of natural language has had a simple consequence for research founded on the structuralist approach: As linguists advanced further and further in their study of form, they kept stumbling more and more often on questions of meaning. There were two types of responses to this epistemological quandary. One was to narrow the scope of syntax so as to exclude, if possible, the troublesome phenomena from the primary data. The other was to widen the scope of inquiry so that issues of form and of meaning could be encompassed simultaneously. But it was now clear, in any event, that the time had come to break away from a science of language centered exclusively on syntax and phonology; it was urgent to concentrate on the difficult problem of meaning construction.

But is this problem a scientifically tractable one? The structuralists didn’t think so; and they were right, given the restrictions they had placed on available data: There is no hope of retrieving interesting principles of meaning organization from surface distributions alone. Fortunately, we need not limit ourselves to the very restrictive data of the structuralist tradition (distributions of words in an attested corpus), or of the generative tradition (native-speaker intuitions as to the well-formedness of strings of words, independent of context, local situations, or cultural assumptions). We have access to much richer and perfectly legitimate sources of data: first, knowledge of the circumstances in which language productions occurred and knowledge of some of the inferences that participants were able to make on the basis of such productions; second, speaker intuitions about possible understandings of expressions in various settings. To be sure, no one claims that it is straightforward to obtain such data. But this is hardly a reason to spurn it: the natural sciences devote much of their energy to devising ways of gathering data that is not readily accessible. Cognitive science successfully takes into account cultural and situational data as well as computational and biological data.

To put things a little differently, language data suffers when it is restricted to language, for the simple reason that the interesting cognitive constructions underlying language use have to do with complete
situations that include highly structured background knowledge, various kinds of reasoning, on-line meaning construction, and negotiation of meaning.\textsuperscript{13} And, for the same reason, language theory suffers when it is restricted to language.

Now all of the above might be right and still irrelevant in practice if we had no idea how to carry out the research program it suggests. And indeed, there has been a good deal of pessimism regarding such programs over the years: There were formalisms at hand for grammar (exported from computability theory) and for truth-conditional semantics (exported from logic); and there was a plethora of informal ideas about meaning in context, the structure of discourse and conversation, and so on. None of this seemed likely to achieve the kind of goals mentioned here—uncovering principles of cognitive construction behind language use. In fact, some philosophers became so wary of mental representations that they preferred to regard language expressions as referring directly to actual and possible worlds. We now have a pretty good idea of why this approach did not work out: When language expressions reflect objective events and situations, as they often do (and often do not), they do not reflect them directly, but rather through elaborate human cognitive constructions and constraints.

What is exciting today is that we are starting to catch a glimpse of what such constructions might be. Philosophical speculation in this domain has yielded to detailed work in anthropology, psychology, cognitive sociology, semantics, and cognitive science more generally. To put it simply, we are beginning to break away from our a priori and everyday life conceptions of how human beings reason, talk, and interact, and to discover some of the models, principles of organization, and biological mechanisms that may actually be at work. What we discover is often surprising and runs counter to "commonsense" beliefs, as well as to highly sophisticated theories.

This brings us back to the topic of this book: mappings between cognitive domains that are set up when we think and when we talk. By and large, such mappings, when acknowledged at all, had been confined to phenomena considered peripheral, such as literary metaphor or analogy. But recently, there has been mounting evidence for the central

\textsuperscript{13} Everyday meaning construction requires on-line creativity (see Chapters 4 and 6). Moreover, meaning constructions (highly underspecified by language) are negotiated by participants in communication. Lois Bloom, back in 1974, and before the advent of cognitive linguistics, stressed that there is no one-to-one relation between linguistic facts and real-world events; language is directed at the internal mental representation of experience.

role played by various kinds of mappings at the very heart of natural language semantics and everyday reasoning.

Projection mappings will project part of the structure of one domain onto another. The case for metaphorical mappings has been made by Reddy (1979), Lakoff and Johnson (1980), Turner (1986, 1991), Lakoff and Turner (1989), Sweetser (1990), Indurkhya (1992), Gibbs (1994), and many others. We shall have more to say later on about such mappings: the general (and deep) idea is that, in order to talk and think about some domains (target domains) we use the structure of other domains (source domains) and the corresponding vocabulary. Some of these mappings are used by all members of a culture—for instance, in English, \textit{time as space}. We use structure from our everyday conception of space and motion to organize our everyday conception of time, as when we say: \textit{Christmas is approaching}; \textit{The weeks go by}; \textit{Summer is around the corner}; \textit{The long day stretched out with no end in sight}. Mappings become culturally and lexically entrenched, and as Turner (1991) shows, they actually define the category structure for the language and culture. Rather remarkably, although the vocabulary often makes the mapping transparent, we are typically not conscious of the mapping during use, and in fact are liable to be surprised and amused when it is pointed out to us. In such cases, the mapping, although cognitively active, is opaque: The projection of one domain onto another is in some sense automatic. Domain projection mappings may also be set up locally, in context, in which case they are typically perceived not as belonging to the language, but rather as "creative" and part of the ongoing reasoning and discourse construction. There is, however, no formal difference between the lexically entrenched (opaque) cases and the ones that are consciously perceived as innovative.\textsuperscript{15} Many of the latter are in fact simple extensions of the former.

Sweetser (1990) has studied an important case of domain mapping that explains the superficially diverse and logically puzzling uses of modals,
like may, must, or can, in English. Modals express physical laws of nature, social constraints and permissions, logical necessity and possibility, and conversational organization: Animals must die; Cinderella must be home before midnight; Guests may park here; Harry must have forgotten his money; Felix may be a professor but he sure is dumb. Drawing on L. Talmay's work, Sweetser has shown that (at least) three domains—content, epistemic, and speech—were matched and structured by force dynamics. Her general account provides an elegant explanation of the apparent polysemy of modals, and shows how inferences are transferred from a concrete domain (content) to an abstract one (epistemic). One aspect of this work is that our conceptualization of reasoning is linked to our conceptualization of space and motion, as is suggested by the use of spatial expressions to talk about reasoning:

This leads to a new theorem. They reached a different conclusion. This proof stands in the way of your conjecture. Try to think straight. This line of reasoning is taking you in the wrong direction.

Sweetser's account shows how the force dynamics in the content domain of motion is projected onto the epistemic domain of reasoning. A modal like must will mean generally that a force is applied, yielding superficially different senses depending on the domain of application (e.g., physical, social, epistemic, esthetic):

**Animals must eat to survive.**

**Cinderella must be back home before midnight.**

**Nero must have been cruel.**

**The armchair must go in the left corner of the bedroom.**

Lakoff (1987) shows how inference inherently built in a source domain (e.g., containers) will be transferred by projection to an abstract domain (e.g., Boolean logic), and how such mappings will combine to yield different meanings. For example, metaphors of **SEEING AS TOUCHING** and **KNOWING AS SEEING** combine with one sense of over to motivate overlook: the line of sight travels “over” (i.e., above) the object; hence there is no contact; hence it is not seen; hence it is not noticed or taken into account. In contrast, **look over** (“she looked over the draft”), uses a related but different sense of over, a path covering much of a surface, as in “she wandered over the entire field.” This sense combines with the same mappings to produce a very different meaning—the object in this case is seen and noticed.⁴⁶

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Another important class of domain connections are the **pragmatic function mappings**. Pragmatic functions are studied in Nunberg (1978, 1979). The two relevant domains, which may be set up locally, typically correspond to two categories of objects, which are mapped onto each other by a pragmatic function. For example, authors are matched with the books they write, or hospital patients are matched with the illnesses for which they are being treated. This kind of mapping plays an important role in structuring our knowledge base and provides means of identifying elements of one domain via their counterparts in the other. Pragmatic function mappings, like projection mappings, will often be responsible for semantic change over time. Metonymy and synecdoche are pragmatic function mappings.⁷ In language use, pragmatic function mappings allow an entity to be identified in terms of its counterpart in the projection. So, when the nurse says

The gastric ulcer in Room 12 would like some coffee

(s)he is using the illness (the gastric ulcer) to identify the patient who has it.

A third class of mappings, **schema mappings**, operate when a general schema, frame, or model is used to structure a situation in context. In Langacker's cognitive grammar framework (Langacker 1987, 1991), grammatical constructions and vocabulary items “call up” meaning schemas. We can view the elaboration of such schemas by successive steps in the grammatical construction as a set of correspondences between abstract schemas.

As we shall see throughout this book, mappings operate to build and link **mental spaces**. Mental spaces (Fauconnier 1994) are partial structures that proliferate when we think and talk, allowing a fine-grained partitioning of our discourse and knowledge structures. For instance, in saying **Liz thinks Richard is wonderful**, we build a space for Liz’s reported beliefs, with minimal explicit structure corresponding to Richard’s being wonderful. In saying **Last year, Richard was wonderful**, we build a space for “last year,” and in saying **Liz thinks that last year Richard was wonderful**, we build a space for last year embedded in a belief space, itself embedded in a base space. Chapter 2 will examine the notion of mental space in some detail.

Lakoff (1987, chap. 4) mentions that mental spaces are structured by **ICMs** (idealized cognitive models). Again, this can be viewed as a form

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⁴⁶ The complex network of spatial senses of over is analyzed by Brugman 1988.

⁷ Studies in rhetoric usually single out some of the most common pragmatic functions or pragmatic function types and come up with a finite list (a dozen or so) of typical metonymies.
of schematic mapping. Take, for instance, the case where the ICM is a frame, as in Fillmore (1982, 1985), for example, the frame for "buying and selling," with a buyer, a seller, merchandise, currency, price, and a rich set of inferences pertaining to ownership, commitments, exchange, and so on. If a sentence like Jack buys gold from Jill occurs in the discourse, and if Jack, Jill, gold, identify elements a, b, c, in a mental space, then those elements will be mapped onto the appropriate slots in the "buying and selling" frame (Fig. 1.1).

This is also the approach taken by Hofstadter, Clossman, and Meredith (1982). Definite descriptions like "the seller" identify roles in the appropriate frame. In a simple example like the one above, the mapping between space and frame is straightforward. We shall see later on how the power of mappings is exploited in such cases to yield accounts of more complex phenomena. In particular, we shall see how roles are set up as elements in the spaces themselves and are connected to ICMs that serve as default models, and also how frames can be constructed locally within spaces, rather than just extracted from background knowledge.

The mappings alluded to—projection mappings, pragmatic function mappings, and schematic mappings—are central to any understanding of semantic and pragmatic language interpretation and cognitive construction. Once we start looking for them, mappings show up in large numbers and in unexpected places. I will be concerned in particular with mental-space mappings, which link mental spaces set up in discourse and account for logically puzzling properties of various types of phenomena such as counterfactuals, hypotheticals, quantification, atemporal when, narrative tenses and deictics, indirect and direct discourse.

18. Frames of this kind can be very schematic or more specific, depending on how far we delve into our knowledge base to take into account contextual specifications.

If mappings, as claimed above, are so central to meaning construction, one wonders why they have been all but ignored by grammarians, logicians, and philosophers. After all, mappings are at the very foundation of mathematics and structure many scientific theories. Their importance has been acknowledged in cognitive psychology, as by Norman (1988), and in cognitive anthropology (Hutchins 1995). What is more, recent work in neurobiology (Sergi 1999; Churchland 1986; Edelman 1992; Damasio 1994) has stressed the importance of physically instantiated mappings and connections between areas of the brain.19

Why, then, have mappings been overlooked? The answer may be simple: In order for mappings to come into play, there have to be domains to map onto each other. Modern mathematics, which starts out with sets, has the appropriate domains right away; but it took many centuries for mathematics to come upon this fundamental unifying concept, and set theory was the key to unification.

In the case of language, the domains that we need in order to understand language functioning are not in the combinatorial structure of language itself; they are in the cognitive constructions that language acts upon. As long as language is studied as an autonomous self-contained structure, such domains will be invisible. We may have suffered here from a modern epistemological paradox: In studying natural languages autonomously, it is reasonable to treat them formally as sets of strings. And in so doing, one appeals to a branch of mathematics where mappings are not all that important: the theory of formal languages and rewriting systems. Paradoxically, modern linguistics, with its overridingly emphasis on syntax, got itself connected to a mathematics without mappings, exactly the sort that will not help us for the study of meaning.20

2.2. Some Examples

This section takes an informal look at a number of cases where it is fairly transparent that mappings between domains are operating. General characteristics of the data and issues will be pointed out. In the next chapter, major aspects of the mental space framework will be outlined, so that we can tackle the general issue of mappings in language in a precise and comprehensive manner. My goal at this point is to survey the issue in a nontechnical way, and show some of its hidden complexities.

19. Edelman's book stresses the important mutual challenge for neurobiology and cognitive linguistics to account for each other's findings.
20. Phonology broke away earlier from the purely combinatorial perspective: Mappings between levels have become a powerful theoretical concept.
2.2.1. Counterfactuals

Consider the following example offered by Charles Fillmore. Suppose it is said by an angry baby-sitter talking to a rebellious child.

*If I were your father, I would spank you.*

Examples like this are called counterfactuals, because they set up, alongside a presupposed reality ("I am not your father, I am not spanking you"), an imagined situation counter to fact ("I am your father, I spank you"). Counterfactual expressions are not just fanciful flights of the imagination; they are meant to have actual impact on reality and the shaping of real events. How can this be? What kind of inferences are produced? How are they produced?

First, as Fillmore notes, there is more than one way to build up the counterfactual meaning, and different choices can lead to dramatically different consequences. Here are some of the possibilities for our example:

1. **The Lenient Father Interpretation.** The baby-sitter, whom we shall call Sue, believes that the father (Harry) should show more authority. She is suggesting that the father might be well-advised to spank this child (Tom). How can the imaginary counterfactual convey this? Certainly, Sue is not considering a world in which she is the biological father of Tom. Rather, she is constructing a situation in which the father's dispositions (leniency, weakness) are replaced by different dispositions, presented as her own (severity, authority). Why would this entail any criticism of the father or suggest that he modify his behavior? An added pragmatic default principle is needed: $P_1$ (egocentric attribution)—The speaker's behavior and dispositions in an imaginary situation are construed as desirable. $P_1$ is behind the common use of counterfactuals to give advice:

   In your place, I would resign.
   If it were me, I wouldn't put up with it.
   If I were you, I wouldn't mess with me.

   But $P_1$ is by no means obligatory. Sue may be commenting as before on what her dispositions would lead her to do (spank Tom), but mean it as a positive comment on the father's self-restraint or as a negative comment on her own impulsivity.

2. **The Stern Father Reading.** Sue can be understood to be saying something quite different. She is pointing out to the child, Tom, how stern the father is and how lenient she is in comparison. This amounts to telling Tom how lucky he is (given his outrageous behavior) that it is Sue and not Harry who is in charge: Sue will not spank him, but Harry would.

   The grammatical form of the sentence is of course the same as before, and Sue (in reality) is still being mapped onto Harry (in the imaginary situation invoked). But this time it is not Sue's dispositions that get transferred. Rather, it is the father, with all of his real properties including dispositions, who physically takes Sue's place in the local situation.

   Of course, the inference that Tom deserves a spanking might again be derived under this form of the mapping, but through a totally different route. What we see is that the grammatical form of the sentence (if $X$ were $Y$ . . .) invites the understander to find a counterfactual mapping from Sue in reality to an imaginary Harry, but does not fully specify what gets transferred. The imaginary situation impacts on reality by expanding the understander's construal of what is going on: For example, the fact that the father would act in a certain way in Sue's place puts Tom's
action in a familiar context where it is more obvious that it is bad, that he should stop doing it, and perhaps should worry about his father being told about it. Finally, pragmatic defaults like $P_I$ may operate, so that Sue is understood to be pointing out how nice she is, or how lucky both of them are that Harry is away.

The theoretical import of all this is that grammar guides the meaning construction up to a point, and that further choices need to be made at the construction level (specifies the mapping) and at the pragmatics level (relevant implications of the counterfactual).

(3) The Role Reading. There is yet another way to construct a meaning for Fillmore’s example without bringing in Harry at all, or even supposing that Tom has a father. We can take Sue to be saying that, if she had the social attributes of fatherhood, then she would spank Tom. The counterfactual in that case maps Sue onto Sue, but the imaginary Sue, as opposed to the real one, is the father of Tom. Interestingly, from a logical point of view, the objective factors that prevent Sue from actually being the father (she’s a woman, she’s unrelated to Tom, she’s too young, etc.) do not preclude the construction. Again, this is because the point of the counterfactual in this context is to highlight the disanalogy between Susan’s actual role and other conceivable social situations; the point is not to examine the possibility of Susan being Tom’s biological father.

But of course it could be. Suppose the speaker is not Sue but Robert, and that there is some uncertainty as to who Tom’s father is. The same sentence, with the role reading, could be used to argue that Robert is not the father.

In sum, our informal observation of Fillmore’s example suggests the following aspects of meaning construction:

- The grammatical form of the sentence prompts us to look for a mapping from a very partial aspect of the real situation onto a counterfactual one. In the minimum configuration we considered, there are three mappings that will meet the grammatically specified conditions.21
- Each of these mappings may in turn be pragmatically exploited in different ways, so that a larger number of truth-conditionally distinct elaborated meanings are derivable—criticism versus praise of Harry, criticism of Tom, self-praise of Sue, self-deprecation, complaint, implication that the speaker is not the father, and so on.

21. In a richer discourse configuration, there would be more (see Chapter 5). The number of available mappings is not a simple structural property of the expression.

Clearly, if we really want to know how language helps to create full meanings, and how the grammar links up to the interpretation, we need to take all this into account. We also need to study the mapping possibilities directly, because there is no single logical form that we could associate with our sentence, and that would then yield all the interpretations considered, through pragmatic elaboration.

A major focus of this book will be to find out how the mappings operate, and what they operate on. This goal is apparently more ambitious than the traditional one of specifying a semantic representation for sentences in isolation, but we will show that it is in fact more realistic, because there is no such thing as an isolated meaning representation. The language, it will be argued, does not autonomously specify meanings that later undergo pragmatic processing. Rather, it guides meaning construction directly in context.

Now look at another counterfactual that will be studied in detail later.

In France, Watergate would not have harmed Nixon.

As in the previous case, there are many interpretations for this form. Consider the one intended to make a general point about the French political system, something like: A French president in Nixon’s circumstances, and with some of his attributes, would not be harmed (in the way that Nixon was) by a political incident similar to Watergate. How can such a reading arise? Clearly not from building up the almost impossible world in which Nixon is actually the French head of state, and Watergate is really in France. Even less from scenarios where Nixon moves to France in order to avoid the unpleasantness of the Watergate scandal. Rather, the simple example sentence is setting up a complex disanalogy. Its operation requires, first, an elementary analogy between similar political systems, the French and the American—both have presidents, voters, public opinion, occasional scandals, and so on. They can therefore be partially mapped onto each other. Our example sentence is exploiting this analogy to effect a further partial mapping of the two initial domains (French and American) onto a third counterfactual one. The third domain shares the common structure of the first two: president, voters, and so on. It inherits from “France” the majority of its background properties; it inherits from “U.S.A.” relevant properties of the Watergate scandal and President Nixon, but as they are not (and presumably cannot) explicitly specified, there is some latitude in actually pinning them down. The third domain is counterfactual, because there is no reference
to an actual scandal in France, but it produces real inferences back to the initial domains, in the form of a disanalogy: Given the structural analogy of the two political systems, there could be, and perhaps will be, or have been, Watergate-like incidents in France; but such incidents would not have the same effects as they had in the actual U.S. case. Notice how this comment, although based on a counterfactual, is quite informative, for it presents a law-like generalization about France and makes predictions about past and future events.

2.2.2. Analogy, Metaphor, and Conceptual Systems

Our conceptual networks are intricately structured by analogical and metaphorical mappings, which play a key role in the synchronic construction of meaning and in its diachronic evolution. Parts of such mappings are so entrenched in everyday thought and language that we do not consciously notice them; other parts strike us as novel and creative. The term metaphor is often applied to the latter, highlighting the literary and poetic aspects of the phenomenon. But the general cognitive principles at work are the same, and they play a key role in thought and language at all levels.

Consider the recent emergence of the notion “computer virus.” It is manifested linguistically in expressions like the following:

Viruses are programs developed by renegade computer operators who covertly implant them in other programs.

Infections can spread from computer to computer as fast as the Hong Kong flu.

Files are contaminated by infectious bytes.

Compuserve can never be completely immune to hidden killers.

Data physicians develop vaccines, disinfectants, ... The only way users can be assured that their programs are healthy is through a safe interface.

We can all see that vocabulary from the domain of health, biology, and medicine is being used to talk and reason about the domain of computers and programming. Viruses have been mapped onto undesirable, harmful programs, which replicate themselves, erase files, and so on. Vaccines are mapped onto programs that counter the first; physicians map onto computer technicians, attempting to block the action of the harmful programs, and so on.

Mappings

The example is in many ways straightforward. And it is readily assimilated by speakers of the language long before dictionaries and manuals formally record the new meanings that arise. Yet the process is cognitively complex and consists of several nontrivial stages and transitions typical of what goes on in all other areas of our conceptual systems. Here are some aspects of the evolution of such a conceptual system under pressure from analogy, metaphor, the real world, and other already available mappings and generic frames.

(1) Analogy and Schema Induction. We are able to recognize generic-level features of biological viruses that are independent of their biological nature but follow from the way we conceptualize them and relate them to other aspects of our lives. For instance:

- $x$ is present, but unwanted; it comes in, or is put in, from the outside; it does not naturally belong;
- $x$ is able to replicate; new tokens of $x$ appear that have the same undesirable properties as the original $x$;
- $x$ disrupts the “standard” function of the system;
- $x$ is harmful to the system, and hence is harmful to users of the system;
- the system should be protected against $x$; this might be achieved if the system were such that $x$ could not come into it, or if other elements were added to the system that would counteract the effects of $x$, or eject $x$, or destroy $x$.

This is not just a list of properties; it is an integrated schema, supported by elementary image schemas, such as “container” and “path,” force dynamics ($x$ tries to get in, the system and its users try to block it), causal schemas (abstract goals of $x$, of users), and so on. A good part of the schema has widespread application in social life: keeping allegedly harmful intruders out of established groups, worms out of apples, spies out of the military, the Trojan horse of Troy ...

The very partial structure of the health domain relative to viruses is not just a random case of the schema. It is, in Langacker’s terms, an archetype: an exceptionally good and readily accessible representative of the abstract schema. It is also one that elaborates the more general intruder schema with some precision: $x$ is hard to spot, $x$ self-replicates. Because the elaborated schema fits the generic aspects of the computer situation, the analogy is successful: the harmful programs also self-replicate, are hard to discern, demand countermeasures, and so on.

Preexisting functional analogies between machines and living organisms
favor the new mapping—computers respond to commands, play tricks
on us, have memories.

As students of analogy often point out, the similarity between do-
mains that gets exploited here is one of structure, not of substance. We
do not, at least in the first stages, use virus or vaccine with any im-
plification that the computer actually has biological properties or substance.
The induced schema that sanctions the analogy is at a very high level
of abstraction. It ignores the technical aspects of each domain. And, in
fact, this makes it accessible to language users who have no knowledge
of medicine or computer science. Such users—by far the majority—
rely on experts to extract the nontechnical generic-level properties
of biological viruses and computer programs. Their understanding of the
input domains is itself limited to highly schematic and non-technical in-
terfaces: when the physician tells me that a virus is in my body and
that penicillin will act against it, I need have only a highly metaphor-
ical interpretation of the complex biological process to which she is alluding.

Analogical mapping is so commonplace that we take it for granted.
But it is one of the great mysteries of cognition. Given the richness of the
domains and their complexity, how are the “right” schemas consistently
extracted, elaborated, and applied to further mappings? And what are
these schemas and generic frames that structure our conceptual systems
so pervasively?

(2) Categorization and New Conceptual Structure. In a second stage,
analogy develops into categorization of the target domain. We can now
assign certain programs to the category “virus,” others to the cate-
gories “vaccine” or “disinfectant.” Computer technicians specialized in
detecting and blocking the harmful programs form a novel category
(“data physicians”).

It is important to realize that the mapping is a way of thinking about
aspects of the target domain and of acting upon it. It is not directly a
reflection of a preexisting objective structure of that domain. We can
start looking for “disinfectants” and “vaccines,” we can think of making
our system “immune” or “safe” before we know if this is technologically
feasible, and a fortiori before the computer domain actually contains any
real equivalents of “disinfectants” or “immunity.” In this kind of case, we
are not just conceptualizing an already given domain in a certain way,
we are actually building it so that it fits the mapping; the technicians
and inventors are finding programs, counterprograms, blocking devices
that will fit the generic conceptual specifications of the health/computer
analogy.

Of course, there might be no real instantiation of this conceptualiza-
tion: reality might stand in the way of building a domain that would meet
the conditions abstractly specified by the mapping. Then, the adopted
categorization might break down simply because “it doesn’t work.” In-
terestingly, in the case of computer viruses, it goes through: the conцеп-
tualization is viable and guides the technical work with some success.
But not once more the high-level schematic nature of the mapping: at
a lower level, the technicians will no longer be using the biological
analogy—they will be relying on domain-specific knowledge about
computers.

Language reflects to some degree the presence of analogical catego-
rization and conceptualization by allowing the vocabulary of a source
domain to apply to counterparts in the target. We don’t just say that the
harmful program is “like” a virus. We go ahead and call it a virus. In
all the examples cited above, health vocabulary is directly applied to the
target domain of computers (infections, spread, contaminated, immune,
healthy). Later we shall examine two deep reasons for the existence of
such transfer, mental-space access, and space blending, but for the time
being it is sufficient to view transfer descriptively. When a mapping is
in the first two stages we consider here, the vocabulary transfer is sub-
jectively felt to be “metaphorical”: programs are not really viruses; a
machine is not really healthy or contaminated. The metaphorical voca-
bulary highlights the role of the source domain in providing concep-
tual categorization for the target. But this leads to a third stage of the
process.

(3) Naming and Projected Structure. With the mapping in place and voca-
bulary transfer operating, the target finds itself named and structured.
Expressions like virus, protection, and disinfectant can be viewed as
applying directly to the new conceptual categories of the target domain.
This does not sever the link between the original source domain and the
target or diminish the importance of the source as an archetype for some
abstract properties of the target; but it does modify our synchronic con-
ception of the vocabulary itself. We no longer feel ourselves to be talking
about certain programs “as if” they were viruses; rather, our subjective
and not very conscious impression is that we are now using the term virus
to speak of such programs. This aspect of naming is often misunderstood and leads to needless controversy. In many accounts of meaning, the incorrect interpretation of the phenomenon is that the metaphor is now dead and that words such as *virus* have acquired new meanings. In fact, quite the opposite is the case. The analogical mapping is not only alive, it is now entrenched in the conceptual and grammatical system. What the entrenchment does is make the mapping less noticeable at a conscious level; but at another level, it is more available than ever for reasoning, inference transfers, and conceptual elaborations. In a sense that will be made precise in Chapters 2, 4, and 6, the conceptual network has been extended by the analogical mapping and the vocabulary finds itself simultaneously associated with mapped counterparts. This enables us to think directly of *computer viruses* without consciously activating the source biological domain, and yet to use the relevant conceptual properties of that domain, because they are now projected inherently onto the target and linked to the generic, more abstract, induction schema that motivated the analogy in the first place. At the same time, *virus*, when used in the computer domain, is now endowed with additional more specific attributes not in the source or in the induction schema. In that sense, we do have an evolution of meaning: as we construct and understand our target domain in finer detail, the term *virus* in that domain will come to be associated with many features that were not present at the outset in any of the inputs (source, target, induced schema). And such features will usually be absent from the source and specific to the target. From that point on, several scenarios can occur: blending, motivated polysemy, or divergence.

(4) Blending and Conceptual Integration. Blending, a cognitive operation introduced in Fauconnier and Turner (1994), will be examined in some detail in Chapter 6. Informally, it consists in integrating partial structures from two separate domains into a single structure with emergent properties within a third domain. In the virus example, it works like this: once the mapping between health and computers is in place, with common vocabulary applying to mapped counterparts, it is possible to blend the two notions of *virus* (biological and computational) into a third integrated notion that incorporates the first two and goes beyond them. This amounts to a formation of novel categories denoted by single terms. In the extended domain that we build, the term *virus* covers a category containing both the biological organisms and the harmful programs. They are now conceived to be "the same kind of thing," not just counterparts in an analogy or domain-specific instances of an abstract schema. In the blend, then, there is a virus category, of which the biological viruses and the computer viruses are two subcategories. Members of the new category are not restricted to members of the input domains (health and computers). The blend opens up a possible search for members in other domains—for instance, social viruses or mental viruses (destructive ideas that propagate, mutate, and replicate).

Note that the generic induction schema is usually insufficient to define what will fall into the blend. It is too skeletal and abstract. The blend, on the contrary, is typically richer than its input structures: it elaborates a category in many directions, containing specific instances and the fine details that go with them.

When a blend gains consistency, it reorganizes our categories and allows thought to move in new directions. There is evidence that the computer virus conceptualization has moved in this way for some of us. As reported by the *New York Times*, J. Doyne Farmer, a researcher at Los Alamos National Laboratory, writes: "Although computer viruses are not fully alive, they embody many of the characteristics of life, and it is not hard to imagine computer viruses of the future that will be just as alive as biological viruses."

Of interest here, of course, is the integration of the two virus counterparts into a single blended category, and also the introduction of new issues: What is it to be "alive," "fully alive," beyond the confines of biology? The question would not have made sense at an earlier stage of the conceptual evolution, when the notion of "alive" was not one transferred from the biological to the computational domain. It is also worth noting that Farmer writes in the context of research on "artificial life."

In this research, the direction of the analogical mapping linking biology and computation has been reversed: What comes under scrutiny are the computational properties of biological evolution and the simulation by genetic algorithms of evolutionary phenomena. We thus have mappings in both directions, and this clearly facilitates the blending integration process. If successful, such a blend would support a novel science in which artificial and biological life are no longer fundamentally distinguished.

Also relevant are the deeply entrenched metaphors of life in everyday talk: a battery is dead, a theory is alive and well, ideas are born, die, resurrect, and so on. At the highest level, motion is life (analogically); immobility, disappearance, inability to function, are death.
(5) Motivated Polysemy. Instead of blending together, the two domains in correspondence may stay apart, and even become increasingly distinguished, but without losing their analogical and linguistic links. In the virus example, this happens when terms like virus and disinfectant are applied so automatically to the target domain that they are no longer felt to be analogical or metaphorical. At one level of use, a feeling of polysemy is produced. The word virus means two different things: the microbe and the sneaky program. At a less conscious level, however, the biological and computational networks of meaning remain linked. The source domain of health and biology remains “in the wings” and can be used at any time to provide further vocabulary and, more important, new ideas for dealing with the target. One reads of computer viruses infecting new machines and lying dormant for weeks, and of the urgency of establishing centers for disease control for computer viruses. This is not just a manner of speaking. Just as the AIDS virus is foremost in our minds, so there is genuine fear among computer scientists that artificial viruses may get out of control and spread to countrywide networks, with catastrophic economic consequences. In trying to deal with such dangers, scientists once again export conceptual information from the biological source. The newspaper article quoted earlier reports that, according to some specialists, the answer is to adopt more heterogeneous software: “more diverse software would make it difficult for computer viruses to spread widely, just as the diversity of biological life keeps a single invader from wiping out entire populations.”

(6) Divergence and Extinction. Real divergence between domains occurs when the vocabulary remains but the conceptual links disappear, or when a source domain changes its vocabulary while the target keeps the original vocabulary, so that the mapping is no longer linguistically transparent. The latter change is a widespread and recurring feature of language evolution. As Sweetser (1990) emphasizes, conceptual mappings linking vision, manipulation, and knowledge are found over and over again in languages. In modern English, grasp retains the senses of seizing and understanding, see applies to vision and to intellect; we can catch a prey, catch sight of a comet, catch the meaning of a joke. But many words become specialized for use in one or the other of the linked domains: behold (for vision, from hold, in the manipulation domain), perceive (from Latin -cipio, “seize”), idea (from Greek idein, “see”).

2.2.3. “Catching up” and “getting ahead”:
Common Expressions That Depend on Complex Mappings

Here is an example of how general mappings produce surface language data, and how in turn such data can be used to discover underlying domains and correspondences. Consider the following:22

(1) I can’t catch up with myself.

The speaker who uttered (1) was saying that she had fallen behind in her schedule and could not “catch up,” that is, could not get all of her planned activities done in the shorter time that she now had left. We take as given the basic spatial sense of catch up. The prototype would presumably include two entities moving along the same path, and a time interval during which one of them is behind the other and at the end of which they are at the same point on the path. Elaborations and extensions of such a prototype are easy to come by, as in cases involving short cuts, sailing regattas, and the like.23 If applied to (1), this sense does not give us what we want: I and myself must both apparently refer to the speaker, who would require special powers of ubiquity in order to be able to race against herself. Not only is this a weird interpretation; it seems to have

22 Thanks to Jo Rebo for this example.
23 The moving objects are not necessarily on the same physical path, but they are on a common virtual path.
no connection to the intended understanding (having too many things to do). To see what is going on, we have to look at a larger sample of data and at some principles of cognitive construction.

First, there is the TIME/SPACE metaphoric mapping. In English and many other languages, we talk about time using a spatial vocabulary. Individuals and other objects “move” on a time axis from “time point” to “time point.” So we find ourselves close to Christmas, we reach the end of the week, we go past the deadline, we do something on Tuesday, or at three o’clock.

For reasons that are presumably physical, times and events are also associated. An event is typically associated with a time point or time interval. Linguistically, this may be indicated by choosing a time word that denotes a time point or interval smaller, equal to, or larger than the time the event actually lasts: The mechanic will fix your car at three o’clock. Joe will work on the car from 3 to 4. They’ll do your tune-up on Friday. Cultural rather than purely physical time scales are typically used.

Types of events (or of behavior, etc.) are commonly associated with time for social, cultural, and historical reasons: “wearing mini-skirts” in “the sixties,” “jogging” in “the seventies,” “using personal computers” in “the eighties.” This cognitively conditioned kind of correspondence gives rise to interesting idioms with spatial vocabulary, such as to keep up with the times, to be ahead of one’s time.

The cognitive construction behind such idioms is nontrivial. There is motion on two levels: the times move, and the individuals move; on a third level, we have the events typically associated with the times. An individual i is in correspondence with a type of event E in which he/she engages, and with a time t at which he/she lives. E in turn is linked to a time T (the typical time frame for events of type E). The default case is of course T = t; the individual engages in events typical of the time at which he/she lives. But if t and T are different, we have configurations as in Fig. 1.2.

For example, someone who is “behind her time” because she still jogs in the nineties instead of doing bungee jumping would occupy position i, as shown in Fig. 1.3.

We have three mappings, call them F, G, H: F maps individuals onto times at which they live and can be indicated by a simple possessive: Caesar’s time, my time (as in: In my time, young people knew how to

24. Or the individual is fixed, and times move. Christmas approaches; goes by; looms ahead.
25. On and at are basic spatial prepositions.

26. Technically, what we have here is a Motion Model. In the model, the times are spatial points on an axis. The individual i is associated with two moving points occupying positions t and T on this axis. Because there is motion, the model has a time of its own having nothing to do with the axis, which is spatial in the model (even if it maps onto time in the world).
have pragmatically determined values upon which members of the same culture who speak the same language may of course disagree.

Given mappings of this sort, and the time-scale organization, we account for the extension of common spatiotemporal meanings of expressions like keep up and catch up to the abstract domains of fashion and life-style. The norm, as mentioned above, is for the individual i and his/her time (t = F(i)) to have the same position on the time scale. As both are moving in the cognitive construction, the norm (or default case) is for the individual and the time to move at the same rate. In order to keep up with the times, an individual i must be mapped onto F(i) by the mapping G o H, that is, must be engaged in events of the type associated (by G) with F(i) (the time of the present for the individual); not to keep up is to be mapped by G o H onto times earlier than F(i), namely, to remain engaged in activities characteristic of earlier times. An individual must catch up if he has fallen behind. Catching up entails a repositioning on the spatial scale to the expected position (the norm). In the cognitive construction under study this repositioning depends on the value of the mapping G o H. The correct inference is that the individual modifies his activities, so that H(i) = E, and G(E) = F(i).

Let us return to the example of “catching up with oneself.” The context here is one of scheduling. Events on the event scale are activities to be performed at given times by the individual. The individual is associated with the events in two different ways. At any given time, the individual is linked to the event she is actually engaged in and to the event she should be engaged in, according to the schedule. Cognitively, this abstract situation is mapped onto a concrete spatial motion model. In the model, events are positions on one path, times are positions on another. The individual is moving on two correlated paths: the path of scheduled events and the path of real times. This model is reflected by spatial vocabulary in language expressions like: The queen went through all the events on her schedule and was exhausted when she reached the end of the day (see Fig. 1.6).

The Speed on the time scale cannot be controlled by the individual, but speed on the event scale can. The norm is for E and E' to coincide, that is, for the individual to be moving in correlated positions on the two scales. The controllable motion on the event scale will use the uncontrollable positions correlated with the time scale as a landmark. In other words, the individual's actual position E' will be evaluated relative to the scheduled position E, as being behind, or ahead. Because of the event/time
principle by real-world time and activities scheduled for that time; the second one by real-world activities that the individual is engaged in at that time.

This scheme allows motion in the cognitive domain to be used to draw real-world inferences: as noted above, expressions like *catch up, fall behind, and be ahead* will specify the cognitive construction in various ways by positioning the individual on the time and event scales. The configuration will then be transferable to its real-world counterparts by the kind of correspondences outlined above: if $i_a$ is at point $E'$, the individual is engaged in event $E'$; if $i_a$ is at $E$, then the individual should be engaged in $E$.

What is remarkable in the example *I can't catch up with myself* is the reflexive pronoun *myself*. Reflexives often indicate simple coreference: in *I hate myself, I and myself are taken to “refer” to the same person. But, more generally, as shown in *Mental Spaces* (Fauconnier 1994), we can get a reflexive if two elements of a cognitive construction are linked to the same trigger. So, in *Norman likes to read himself, Norman identifies a writer a, himself identifies books b; b is connected to a by the pragmatic function W, linking authors and their work: W(a) = b.* The author a in this case is the trigger, linked to b by the pragmatic function W.

The example studied here (*I can’t catch up with myself*) is analogous: the motion signaled by the verb *catch up* is taking place on the spatial time scale; the two moving points are $i_a$ and $i_b$, and they are linked to the same trigger $i$. The two points can therefore be identified by a word pointing to their common trigger, in this case *I* and its reflexive form *myself*.

The abstract nature of this entire process should not be underestimated. Converting the cultural notion of a schedule with activities to be done at certain times into a motion schema with imaginary scales is really a spectacular cognitive construction. It allows entrenched inference patterns from physical motion models to be used in reasoning about a cultural model that is objectively quite different in nature. Mappings, as we saw, play a central role. What must be underscored is that the mappings are not indicated explicitly by the language vocabulary in *I can’t catch up with myself*. What the language does show is that a motion model is involved, and that the individual (here the speaker of the sentence) is a trigger for the two moving points in the model.

The account just given captures some of the complexities of this cognitive construction. Yet it is probably still oversimplified. Fauconnier...
and Turner (1994) argue that blending is also at work here (see Chapter 6, section 7).

It should also be noted that one cannot infer a complex model like the above on the basis of a single example or even a small range of language data. General, well-attested, mappings such as TIME/SPACE are invoked along with independently motivated principles, such as reflexive morphology for common triggers and data of different kinds (like keep up with the times, be ahead of one’s time, fall behind, move into the twenty-first century, etc., in our example).

Another difficulty in dealing with such phenomena is that intuitively they sometimes seem very obvious: of course we use catch up; how else would we talk about “catching up” on our schedule? This illusion of simplicity is a well-known consequence of our double status as observers and competent performers. The performer has such mastery and expertise in the manipulation of cognitive constructions that (s)he actually conceptualizes situations to some extent in terms of these very constructions, and therefore finds nothing intuitively mysterious about the corresponding data. The observer will slowly come to realize that much deeper things are going on, but will often still struggle to dissociate his/herself from her/his alter ego, the expert performer.

The illusion of simplicity is largely a consequence of our double status as observers and performers. It is hard to be the zoologist and the elephant at the same time. Perhaps this illusion is especially strong in the case of phenomena pertaining to meaning. But of course it pervades the social sciences. The illusion of simplicity is strengthened by our cultural folk models about language and meaning. These models are essential to our everyday conception of talking and thinking; because we are all virtuosos in manipulating exceedingly complex mental constructions, it is important that when performing, we think of them as straightforward and direct. Tennis champions would be ill-advised to reflect while they are playing on the psychological and biological subtleties of their efforts; but their coaches and physicians are forced to take a different point of view.

Another illusion can deceive us—the illusion of rarity. When some example is discussed, such as the one above, I can’t catch up with myself, even if we acknowledge its hidden complexity, we tend to see it as a curiosity that requires a “special” explanation against a background of otherwise “well-behaved” phenomena. There seems to be a largely unconscious effort to hold to a supposedly “classical” view, by assuming that many (very interesting) phenomena are “rare,” or marginal, or peripheral. This lets in some circularity, because “marginality” is easily attributed to that which eludes classical accounts.

Our approach seeks to dispel the illusion of rarity. First there is the matter of what data is relevant. In the natural sciences, crucial experiments are performed by creating extraordinary circumstances. Giant accelerators are built to create and observe “rare” phenomena. Or, for that matter, “rare” chemical reactions (such as $\text{H}_2 + 1/2\text{O}_2 \rightarrow \text{H}_2\text{O}$) are produced in artificial laboratory environments. The same is true of cognitive language data. Statistically infrequent examples produced in statistically infrequent circumstances are apt to shed light on the basic mechanisms of everyday thinking and talking. Then there is the related question of typicality. There has been a tendency in modern semantics to give accounts of so-called fragments of language. The rationale was that a successful theory for a fragment could later be extended to other chunks of the language. In the same way, and for the same reason, only supposedly “simple” or “typical” conditions of use were considered; again, the hope was that more “unusual” uses would follow by extension or from as yet poorly understood pragmatic principles. This hope has not been fulfilled: fragment theories do not have natural extensions, and there are deep and interesting reasons for why this is so. To see the fallacy that we are dealing with here, suppose mathematicians attempted to extract the general properties of functions from the study of a few simple, “typical” ones, for example, $f(x) = a$, $f(x) = 1/x$, $f(x) = e^x$. Clearly, regardless of how interesting those particular functions might be, no general theory would emerge, no natural extension would apply. A comprehensive theory will work in the other direction: It will seek to provide a general theory of functions that will correctly predict what happens when special conditions are imposed (so that special functions are singled out). The very same is true of meaning phenomena: The special, or “typical,” cases should follow from generally applicable principles.

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27. There is a wealth of admirable work in sociology and anthropology that reveals the far-reaching complexities behind our apparently nonproblematic everyday life. Erving Goffman (e.g., 1959, 1974) had a special talent for bringing out this fascinating dimension. In linguistics, it was not until the advent of powerful transformational and generative techniques that the awesome formal complexity of grammatical structure was acknowledged.

28. Studying particular functions might, however, be heuristically very useful in order to devise a general approach.
Chapter 2
Mental-Space Connections

1. The Cognitive Construction Perspective

Language, as we know it, is a superficial manifestation of hidden, highly abstract, cognitive constructions. Essential to such constructions is the operation of structure projection between domains. And therefore, essential to the understanding of cognitive construction is the characterization of the domains over which projection takes place. Mental spaces are the domains that discourse builds up to provide a cognitive substrate for reasoning and for interfacing with the world. This chapter will recapitulate the main properties of mental-space connections.

Under a standard and popular view of language organization, the joint production of form and meaning results from the divided labor of several theoretical components. The semantic component "interprets" syntactically generated structures, by assigning them context-independent truth conditions. A pragmatic component, itself possibly divided into subcomponents, is able to fix up this "literal" interpretation in various ways and to take the context into account.

Although this perspective turns out to be inadequate, it has proven quite useful for the purpose of framing important questions in a precise way, and it has provided initial, powerful methods for classifying "facts" pertaining to meaning and dealing with them analytically. Until the mid-sixties, it was still assumed within linguistics that no operational study of natural language meaning was feasible unless it stemmed from a study of form. The great success of research in syntax at the time suggested that the underlying levels of sentence structure discovered on the basis of distributional regularities would be the key to a genuine scientific approach to natural language semantics. Then, within linguistics, semantics and pragmatics slowly emerged, with a lot of help from work that had been going on for many years in philosophy of language. It became possible to go well beyond the syntax-centered approach, and a host of semantic and pragmatic phenomena came to be studied for their own sake and in their own terms, on a par with other kinds of language data. It is noteworthy that the division into components applied not only to the theory, but to the pretheoretical data as well, so that there was often agreement as to the taxonomy of the observations—for example, "semantic scope ambiguity," "pragmatic implicature," "figure of speech," and so on.

The divided components theory, in which semantics had to do with the structure of language while pragmatics was linked to communication, filled a void. But it ran into countless difficulties. In particular, it failed to give interesting (or, for that matter, accurate) accounts of many truth-related phenomena, it tried unsuccessfully to reduce pragmatics to communication, and it did not achieve desirable generalizations and unifying explanatory principles. A number of natural-language investigators turned to a more dynamic, integrated, cognitive, outlook.

Here are some characteristics of the cognitive approach:

1. Linguistic forms are (partial and underdetermined) instructions for constructing interconnected domains with internal structure.

2. A strong incentive for this approach to pragmatics coupled with truth-conditional semantics was the work of Paul Grice (1967, 1975). Grice showed that, in simple cases, standard logic could be retained as a basis for literal meaning, by allowing implicatures to be added pragmatically, on the basis of conceptual and other pragmatic principles.

3. The impoverished view of meaning that went along with generative syntax is expounded in books of that period such as Fodor and Katz (1964) and Chomsky (1965).

4. Early generative semantics pursued this tack systematically and developed arguments for sophisticated and abstract underlying syntactic structures that looked more and more like logical forms assembled out of primitive elements.
unification) outweigh any a priori conceptions of the studied phenomena. Moreover, they apply not only to the principles but also to the primitives within a theoretical framework.

In the current work on connected domains, scientific generalization is a guiding force at many levels and supersedes, as it should, philosophical or ontological prejudice.

Two general features are important in this regard: (a) in some respects, language treats in the same way domains whose objective counterparts (if and when they exist) are quite different. For example, it turns out that domains of the same type (mental spaces) are set up for temporals, beliefs (and other propositional attitudes), images, hypotheticals, counterfactuals, dramatic situations (plays, movies, and the like), scenarios, quantification schemas, and many others. (b) We find the same principles applying in areas traditionally assigned to different components. This is the case for optimization, for the access principle, and for matching, which play a crucial role in explaining metaphor and metonymy, pragmatic functions, referential opacity, temporal ambiguities, presupposition projection, or counterfactual grammar and interpretation. Metaphor and metonymy are traditionally assigned to rhetoric, pragmatic functions to pragmatics, opacity and ambiguity to semantics or syntax, presupposition projection to semantics and/or pragmatics. And yet, fundamental principles of level C are at work in all of these phenomena.

8. Finally, the approach recognizes the importance of connections and mappings, stressed in the previous chapter. Much of this book is devoted to exploring abstracts of structure projection between mental spaces. But considerably more work lies ahead. In spite of some success in uncovering principles at work, mental space connections remain mysterious in many respects. They are, for the time being, beyond the scope of either symbolic or connectionist computational techniques, a point that raises challenging questions for cognitive science in general.

2. Space Building

2.1. Discourse Configurations

A language expression $E$ does not have a meaning in itself; rather, it has a meaning potential, and it is only within a complete discourse and in context that meaning will actually be produced. The unfolding of
discourse brings into play complex cognitive constructions. They include the setting up of internally structured cognitive domains linked to each other by connectors; this is effected on the basis of linguistic, contextual, and situational clues. Grammatical clues, although crucial to the building process, are in themselves insufficient to determine it.

An expression can be said to generate meaning. When the grammatical information it contains is applied to an existing cognitive configuration, several new configurations will be possible in principle (i.e., compatible with the grammatical clues). One of them will be produced, yielding a new step in the construction underlying the discourse.

When approached in this way, the unfolding of discourse is a succession of cognitive configurations: Each gives rise to the next, under pressure from context and grammar. A language expression entering the discourse at stage n constrains the construction of a new configuration, together with the previous configuration of stage n−1 and various pragmatic factors.

The configurations produced will undergo further pragmatic elaboration. They have the important characteristic of partitioning information, by relativizing it to different domains. The importance of partitioning for reasoning, and more general cognitive purposes, is stressed in Dinsmore (1991). The domains constructed in this fashion are partially ordered by a subordination relation; a new space M′ is always set up relative to an existing space M that is in focus. M is called the parent space of M′, and in subsequent diagrams the subordination relation will be represented by a dashed line as in Fig. 2.2.

The spaces set up by a discourse in this way are organized into a partially ordered lattice (Fig. 2.3). At any given stage of the discourse, one of the spaces is a base for the system, and one of the spaces (possibly the same one) is in focus. Construction at the next stage will be relative either to the Base Space or to the Focus Space. Metaphorically speaking, the discourse participants move through the space lattice; their viewpoint and their focus shift as they go from one space to the next. But, at any point, the Base Space remains accessible as a possible starting point for another construction.

The mental spaces set up in this manner are internally structured by frames and cognitive models, and externally linked by connectors, that relate elements across spaces, and more generally, structures across spaces.

New elements can be added to spaces by linguistic expressions (e.g., indefinites) or by nonlinguistic pragmatic conditions (e.g., objects which are salient in the interaction that produces the discourse).

A sentence that appears at some stage of the discourse construction will contain several kinds of information, indicated by various grammatical devices:

- information regarding what new spaces are being set up, typically expressed by means of space builders (cf. below);
- clues as to what space is currently in focus, what its connection to the base is, and how accessible it is, this last notion to be explicated below; this information is typically expressed by means of grammatical tenses and moods;
- descriptions that introduce new elements (and possibly their counterparts) into spaces;
- descriptions or anaphors or names that identify existing elements (and possibly their counterparts);

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7. As in the example of the stem and lenient fathers discussed in Chapter 1 (section 2.2.1).
8. This is the scheme developed in Dinsmore 1991.
2.2. Some Grammatical Devices for Cognitive Construction

Language has many devices to guide the construction and connection of mental spaces. Here are some of them.

**Space builders.** A space builder is a grammatical expression that either opens a new space or shifts focus to an existing space. Space builders take on a variety of grammatical forms, such as prepositional phrases, adverbials, subject-verb complexes, conjunctions + clause; for example, in 1929, in that story, actually, in reality, in Susan's opinion, Susan believes, ..., Max hopes, ... , If it rains, ... . Grammatical techniques and strategies for building spaces in Japanese and English are compared in Fuji (1992). The psychological effects of using explicit space builders in discourse are examined by Traxler et al. (1995).

**Names and descriptions** (grammatically noun phrases). Names (Max, Napoleon, Nabisco) and descriptions (the mailman, a vicious snake, some boys who were tired) either set up new elements or point to existing elements in the discourse construction. They also associate such elements with properties (e.g., “having the name Napoleon,” “being a boy,” “being tired”).

**Tenses and moods.** Tenses and moods play an important role in determining what kind of space is in focus, its connection to the base space, its accessibility, and the location of counterparts used for identification.

**Presuppositional constructions.** Some grammatical constructions, for example, definite descriptions, aspectuals, clefts, and pseudo-clefts, signal that an assignment of structure within a space is introduced in the presuppositional mode; this mode allows the structure to be propagated into neighboring spaces for the counterparts of the relevant elements.

**Trans-spatial operators.** The copula (be in English) and other “copulative” verbs, such as become, remain, may stand for connectors between spaces. (The general function of be is to stand for domain mappings; connection between spaces is a special case of this general function.) Consider a grammatical structure of the form NP₁ be NP₂, where NP₁ and NP₂ are noun phrases, and identify elements a₁ and a₂, respectively, such that a₁ is in space X and a₂ is in space Y. Suppose F is the only connector linking spaces X and Y. Then the language expression NP₁ be NP₂ will stipulate that a₂ in Y is the counterpart of a₁ in X via connector F:

\[ a₂ = F(a₁) \]

**Identification of elements.** A crucial property of language, cognitive constructions, and conceptual links is the Access Principle (also called Identification principle). This principle states that an expression that names or describes an element in one mental space can be used to access a counterpart of that element in another mental space.

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The wide range of application of this principle to different kinds of domains and different kinds of consciousness is studied in my Mental Spaces (1994). The Access Principle shows up in a variety of phenomena, and in different modalities. Van Hoek (1996) and Lidz (1995) have shown how the signing modality for sign language exploits the Access Principle in very interesting ways. Erez (1988), Lakoff (1996), and Rubia (1996), among others, show unusual and powerful examples of access in psychological and cultural cases. Paquot and Sweetser (1996) review the typical cases.
When this indirect identification procedure is used, we say that the element named or described, \( a \), is the trigger, and that the element identified, \( b \), is the target.

### 2.3. Examples

The following examples will help give an idea of how mental-space configurations are built up. The account is somewhat simplified, in order to provide a first pass through the system.

#### 2.3.1. Romeo and Juliet

Notation: As mentioned above, some of the lexical information in a sentence will connect mental-space elements to frames and cognitive models from background knowledge, and this will structure the space internally. Suppose, for instance, that we are engaged in a conversation about Romeo and Juliet, and the following statement is made:

*Maybe Romeo is in love with Juliet.*

The English sentence brings in a frame from our prestructured background cultural knowledge, “\( x \) in love with \( y \),” with two roles highlighted (the lover, \( x \), and the loved one, \( y \)) and rich default information linked to the idealized cognitive model tied to this frame. The word *maybe* is a space builder; it sets up a possibility space relative to the discourse base space at that point. The base space contains elements \( a \) and \( b \) associated with the names *Romeo* and *Juliet*, and presumably those elements have been linked to other frames by background knowledge and previous meaning construction in the conversation. The new sentence sets up the possibility space, and creates counterparts \( a' \) and \( b' \) for \( a \) and \( b \), which can be identified by the names *Romeo* and *Juliet*, in virtue of the Access Principle. The new space is structured internally by the frame “\( x \) in love with \( y \),” whose roles are filled by the elements \( a' \) and \( b' \). Frames will be denoted here by capitalized words with some mnemonic value, for instance, in the present example LOVE. And the familiar notation

\[
\text{LOVE } a'b'
\]

will be used to denote the internal structure added to a mental space \( M \), namely, that elements \( a' \) and \( b' \) in space \( M \) fit the frame \( \text{LOVE} \).

In diagrammatic form, all this will be expressed in the kind of representation given in Fig. 2.4. The dashed line from \( B \) to \( M \) indicates that \( M \) is set up relative to \( B \) (it is subordinate to \( B \) in the lattice of discourse spaces). \( \exists \) is the connector (in this case identity) linking \( a \) and \( b \) in space \( B \) to \( a' \) and \( b' \) in space \( M \). The boxes represent internal structure of the spaces next to them.

Structure from the parent space is transferred to the new space by default. In the present case, this has the effect of associating \( a' \) and \( b' \) with the names *Romeo* and *Juliet*, and also with other background structure for their counterparts \( a \) and \( b \) in \( B \). The default transfer, called *optimization*, will apply to the extent that it does not contradict explicit structure in the new space. For example, suppose that the conversation participants are talking about Romeo's hostile behavior toward Juliet. In \( B \), this has the consequence that Romeo doesn’t like Juliet. But this background structure will not transfer to the new space \( M \), because it contradicts the explicit structure \( \text{LOVE } a' b' \). Names will not transfer either if they are explicitly ruled out in the new space. For in:

*Maybe, Romeo and Juliet's names are really Dick and Jane.*

This example also underscores that \( a' \) and \( b' \) are accessed from the base, by means of the names for \( a \) and \( b \), in virtue of the Access Principle.
2.3.2. Achilles and the Tortoise

Here is another example involving more spaces:

_Achilles sees a tortoise. He chases it. He thinks that the tortoise is slow and that he will catch it. But it is fast. If the tortoise had been slow, Achilles would have caught it. Maybe the tortoise is really a hare._

A cognitive construction compatible with this piece of discourse proceeds as follows:

[first sentence] _Achilles sees a tortoise._

_Achilles is a name linked to an already introduced background element a in the Base; the indefinite noun phrase a tortoise sets up a new element b. "—sees—" brings in the SEE frame with a and b in the roles of seer and seen (see Fig. 2.5)._ 

[second sentence] _He chases it._

Background information tells us that Achilles is human and the tortoise is an animal. This allows the anaphoric pronouns _he_ and _it_ to identify a and b respectively in the Base Space. The second sentence simply adds more internal structure to the Base (Fig. 2.6).

[third sentence] _He thinks that the tortoise is slow and that he will catch it._

The space builder _he thinks_ sets up a new space M relative to B that will partition off information about Achilles' beliefs. The complement clause _the tortoise is slow and he will catch it_ will structure this new space internally. Within this complement clause, we find another space builder, the future auxiliary _will_; so a third space W appears, this time relative to M. The time reference in B, has been maintained in M through the present tense; the future tense constrains event structure in W to be ordered in time after event structure in B, as shown in Fig. 2.7.

[fourth sentence] _But it is fast._

This sentence returns us to the Base Space, which at this stage of the discourse remains the Viewpoint (more on this notion below). By default, spaces are assumed nondistinct in structure (Weak Optimization). The
word *but* is an explicit pragmatic signal to override this default: The structure of B differs from that of M with respect to the explicitly constructed structure [FAST b], incompatible with its counterpart [SLOW b'] (see Fig. 2.8).

[fifth sentence] If the tortoise had been slow, Achilles would have caught it.

The conjunction *if* sets up a hypothetical mental space H. The *distal* past perfect tense *had been* indicates that H is counterfactual (with respect to the base B). Two novel structures appear in the counterfactual space H:

- SLOW b1
- CATCH a1b1

The first (corresponding to the protasis of the conditional sentence) is a *matching condition*. It allows space H to be used for further reasoning.

(of the Modus Ponens variety) in later discourse: If a new space matches H with respect to this condition, it will pick up additional structure from H. The semantics of matching are studied in Chapter 5.10 The discourse up to now is in the indicative mood. In the second part of Sentence 5, we find a new mood, the conditional *would have caught* (in the same past perfect tense as the matching condition protasis). This conditional mood is the grammatical sign that the counterfactual space is now in focus. This point will also be taken up again in more detail below. The resulting construction can be diagrammed as shown in Fig. 2.9.

[sixth sentence] Maybe the tortoise is really a hare.

Viewpoint is still from the Base Space. The space builder *maybe* sets up a possibility space P, in which the counterpart of the tortoise "is a" hare. The Access Principle operates here: the counterpart b2 in the new space o, in the more elaborate treatment of Chapter 5, space H is divided into two spaces, a Foundation and an Expansion.
3. A New Look at Classic Notions

It was standard for many years within the language sciences to consider that a natural-language sentence, like a logic formula, could be assigned a context-independent truth-conditional meaning. The tradition, extending from Frege, Russell, and later Quine, to Kripke, Montague, and Lewis et al., was picked up in linguistics as well by Katz, Partee, Keenan, and many others. Many interesting problems were discussed within this framework, and such problems often find illuminating reinterpretations when examined from the domains and connections perspective. I will use the *Achilles* example to review briefly the following ones, which have received more extensive treatment elsewhere,11 referential opacity, scope of indefinites, presupposition projection.


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3.1. Discourse Management: Base, Viewpoint, Focus, and Access

The key to accounting for the kind of classical problems just mentioned lies in understanding how the multiple grammatical clues in a natural-language sentence relate to the ongoing cognitive construction within a discourse.12 As we saw in the *Achilles* example, the sentence is heterogeneous with respect to the mental-space construction process. It contains features responsible for a multiplicity of diverse functions:

- setting up spaces and elements, following a path within the lattice of spaces;
- structuring spaces internally;
- linking them externally by means of connectors;
- indicating what space is in focus, and what type it belongs to (moods and tenses);
- signaling what structures can be transferred by default to higher spaces (presupposition marking);
- accessing elements and their counterparts (definite descriptions, names, anaphors);
- introducing roles and linking them to values;
- establishing matching conditions for spaces that will allow deductive reasoning (e.g., \( L \));
- canceling default implicatures (but).

In order for discourse participants to find their way through the maze of mental spaces, and to use the partitioning for drawing inferences properly, three dynamic notions are crucial: Base, Viewpoint, and Focus. At any point in the construction, one space is distinguished as Viewpoint, the space from which others are accessed and structured or set up; one space is distinguished as Focus, the space currently being structured internally—the space, so to speak, upon which attention is currently focused; and one space is distinguished as the Base—a starting point for the construction to which it is always possible to return. Base, Viewpoint, and Focus need not be distinct; more often than not, we find the same space serving as Viewpoint and Focus, or Base and Focus, or Base and Viewpoint, or all three: Base, Viewpoint, and Focus.13

12. Discourse management of mental spaces is a notion developed by Y. Takubo and discussed in Takubo 1993. Kuno and Takubo 1990. The constructive view of logic and discourse is stressed in formally oriented work such as Dahl 1976, more than twenty years ago. Dahl and Hellman 1995 show that antecedents for anaphors are constructed dynamically in complex ways, standard coreference being just a special case.

13. Duanmoe (1991) introduces the concept of Focus space in mental-space theory. Focus and Viewpoint are studied in detail in Cizer (1994), who adds the notion of Event space. In Chapter 3, I shall show in more detail how to find one's way through the space maze.
In the Achilles example, we start from a Base that is presented as corresponding to reality, or "reality" within fiction. The Base is also the Viewpoint and the Focus at the beginning of our imaginary discourse: It is, in fact, the only space configured until the appearance of the third sentence,

He thinks that the tortoise is slow and that he will catch it.

At this stage, Space M is set up, and is necessarily in Focus: It is the space being structured internally; Focus has shifted from B to M. Space M is accessed from the Viewpoint space B. Now we come upon an underspecification in the system: space B is Viewpoint, and space M is Focus at stage 3. It is possible in principle for Viewpoint to remain in B at the next stage, or to shift to the new Focus, space M.

The next sentence in the discourse,

But it is fast.

builds structure incompatible with M, and is understood relative to B, showing that the Base B, in this case, has been maintained as the Viewpoint, and also that Focus is now shifted back to B. Notice, however, that the discourse could just as well have been continued with something like:

It probably won't take long.

which we could construe as part of Achilles' beliefs, especially if it is followed in turn by But the tortoise is fast. In that case, Focus has remained in M, and furthermore, Viewpoint has been shifted to the belief space M: The information is now presented from Achilles' point of view. But the tortoise is fast would return Focus and Viewpoint to the Base B.

Back to the original piece of discourse: We are back in the Base B. The next sentence,

If the tortoise had been slow, Achilles would have caught it.

sets up the counterfactual, which necessarily becomes a Focus. As before, Viewpoint is not altered; it stays in the Base, from which the next space construction (Possibility Space P) will be effected. But again the configuration at that stage is equally compatible with a Viewpoint shift. Whether or not Viewpoint has shifted is something we find out from the grammar of the next sentence. Suppose, for instance, that the next sentence had been:

He would have had a new pet.

The grammar of this sentence—conditional mood, past perfect tense—tells us that the counterfactual mental space H is still in Focus. And because the sentence stands alone (no space builder such as if), Viewpoint has also shifted: we are now presenting things from the point of view of the counterfactual situation.

3.2. Referential Opacity

The cases of referential opacity and transparency, de re and de dicto interpretations, noted by many scholars for propositional attitudes, turn out to be only special instances of the more general Access Principle. Following the work of Jackendoff (1975), and Nunnberg (1978), this was in fact one of the major initial motivations for developing the theory of mental spaces.

To illustrate, consider a simple situation. Suppose James Bond, the top British spy, has just been introduced to Ursula as Earl Grey, the wealthiest tea importer, and that she finds him handsome. It is equally true that Ursula thinks the top British spy is handsome and that Ursula thinks the wealthiest tea importer is handsome, and both express the same belief. But in the first case the man introduced to Ursula has been described from the point of view of the speaker, whereas in the second he has been described from Ursula's point of view. Although the first description is true and the second is false, Ursula would acquiesce to the wealthiest tea importer is handsome, but not (necessarily) to the top British spy is handsome. Descriptions and names given from the speaker's point of view are called referentially transparent, or de re. Descriptions and names given from the thinker's point of view are called referentially opaque or de dicto. Verbs like think or hope or want that allow such descriptions in their complements are said to create opaque contexts. Opaque contexts present a number of difficulties from a logical point of view, as noted already in medieval studies, and in modern logic by Frege, Russell, Quine, and countless others. In particular, Leibniz's Law holds in such contexts. Leibniz's Law (substitution of identicals) allows a to be replaced for a in a formula, if a = b; for example 25 can be replaced by 5² or by (19 + 6) without changing the truth value of a mathematical statement. But in our little story, if the wealthiest tea importer is actually the very ugly Lord Lipton—that is, the wealthiest
tear importer = Lord Lipton—then sentence (i) is true, whereas (ii) is false:

(i) Ursula thinks the wealthiest tea importer is handsome.
(ii) Ursula thinks Lord Lipton is handsome.

Although the two names/descriptions are true of the same referent, one cannot be substituted for the other salva veritate.

The complexity increases when several opaque contexts are embedded within one another:

Bill said that Iris hoped that Max wanted Ursula to think that the wealthiest tea importer was handsome.

And opacity shows up in a variety of grammatical constructions:

Ursula thinks James is smarter than he is.

In this example, the natural interpretation is referentially transparent: than he is yields James’s actual intelligence as measured by the speaker. A referentially opaque reading has Ursula holding the contradictory belief: James is smarter than he is.

Discussion of opacity in the logical and philosophical tradition has tended to view it as a property of the meaning of propositional attitudes (think, hope, want), and of objects of belief. But in fact it follows much more generally from the Access Principle between mental spaces. According to that principle, an element in a space may be accessed by means of a description (or name) in that space or by means of a description (or name) of one of its counterparts in another space, usually a space serving as Viewpoint at that stage of the discourse construction.

So, in the case of Ursula and the . . . , the following configuration (see Fig. 2.11) might have been built by discourse participants. The next step in this discourse configuration is to structure the Belief space with the additional <HANDSOME b'> corresponding to Ursula’s belief that the man she has just met is handsome. Linguistically, there are two ways to do it. The element b’ can be accessed directly in the Belief space now in focus. With respect to that space, the name Grey or the description the wealthiest tea importer correctly identifies b’. Sentences like the following will therefore add the proper structure:

Ursula thinks that Grey is handsome.
Ursula thinks that the wealthiest tea importer is handsome.

The element b’ can also be accessed from the Base/Viewpoint space, by means of its counterpart b. With respect to that space, the name Bond for the description the top spy correctly identifies b, and can therefore be used to access b’, according to the Access Principle. Hence the following sentences also add the proper structure, using a different path through the space configuration:

Ursula thinks that Bond is handsome.
Ursula thinks that the top spy is handsome.

The first two sentences correspond, of course, to what are traditionally called opaque readings. The last two correspond to transparent ones. Their existence and properties follow directly from the Access Principle. An essential point, often made in the mental-space literature, is that the same ambiguities show up no matter what kind of space (belief, base, movie, counterfactual) we are dealing with. It is the multiple connecting paths available in a partitioned configuration that yield multiple understandings. It is not the content of the mental spaces (propositional attitudes, time, geographical space, images).

Also, the number of paths for a given sentence is not fixed. What matters are the spaces available in a particular discourse. The more spaces accessible from the Focus, the more connecting paths there will
be, and consequently, the more potential understandings for the sentence. For example, the sentence *If I were your father, I would help you* sets up a minimum of three spaces and has a minimum of three understandings, as outlined in Chapter 1, section 2.2.1. But if more spaces are available, there will be more readings. Fauconnier (1990b) shows that if the context for this sentence is the making of a movie, and the speaker is Kirk Douglas and the addressee Jane Fonda, there will be nine readings, because of the increased number of spaces and referential access paths.

A sentence in itself has no fixed number of readings. It has a potential for generating connections in mental-space configurations. The number of readings will be a product of this potential and the spaces available (and accessible) in a particular context.

The *Achilles* example provides a similar instance of the Access Principle at work. Consider the last sentence of the minidiscourse:

*Maybe the tortoise is really a hare.*

This is a case of referential transparency: the definite description *the tortoise* is used to refer to what in the modal context is not a tortoise but a hare. A referentially opaque interpretation is also available for this sentence taken in isolation, implying somewhat contradictorily that the same animal could be simultaneously a hare and a tortoise. The two interpretations are available in principle, because the element *b* can be accessed either directly within the Focus space, by means of characteristics associated with *b* in that space, or indirectly from a Viewpoint space (here the Base), by means of characteristics associated with the counterpart of *b* in the Viewpoint space.

Consider a slightly different piece of discourse:

*Achilles is chasing a hare. He believes that the hare is a tortoise. And he believes he is faster than the tortoise.*

Figure 2.12 shows the corresponding mental-space configuration. The base time, in the last sentence, we find the “referentially opaque” interpretation: *b*’ is identified directly from within the space in Focus, namely, Belief Space M.

In principle, at any point in the discourse a mental-space element can be accessed from the Base, or the Viewpoint, or the Focus. If one space is simultaneously Base, Viewpoint, and Focus, then of course no distinctions will appear. But as soon as Viewpoint, or Focus, or both, get shifted, then different accessing strategies will become available.

When we look at this, not in terms of the unfolding discourse, but in terms of the *isolated sentence*, and its *potential* for meaning construction, it follows that a sentence containing an explicit grammatical space builder, which necessarily shifts Focus, always has the potential for more than one accessing strategy. The sentence *Achilles believes that he is faster than the tortoise*, because it contains the explicit space builder *Achilles believes*, will always appear in a discourse containing at least two spaces, Base and Focus, and so the definite description *the tortoise* in principle be linked to at least two different accessing strategies: one in which it directly identifies an element in the Focus Space, as in the above minidiscourse, and one in which it identifies the counterpart of that element in the Base. This latter interpretation is called for in a reversed discourse situation from the first, such as:

*Even though he thinks it’s a hare, Achilles believes that he is faster than the tortoise.*

Leaving aside the pragmatic scale constructed by *even*, the corresponding mental-space configuration would be as shown in Fig. 2.13. This time, the *same* sentence is used to access *b*’ in M through its counterpart in the Base/Viewpoint mental space B. We have the *de re* interpretation.

When a sentence is examined in isolation, and its interpretations studied, it is necessary to construct implicitly a discourse in which to interpret it. By default, a *minimum* discourse is usually chosen, with the
implication that this will yield the "real," "core," context-independent meaning of the sentence. This implication is unwarranted; there is no reason why the particular configuration associated with a linguistic expression in a minimum discourse should contain the defining characteristics for the meaning potential of that expression in other discourses.

Consider once again our example Achilles believes that he is faster than the tortoise. But suppose that the situation is richer in connections and spaces than the "minimum" default discourse. Then possible interpretations for this sentence will proliferate. In fact, far from being limited to the two we have envisaged (traditional de re and de dicto), the number of logically distinct interpretations is theoretically unbounded.

Suppose, for example, that in the situation where the sentence is used we are talking about a play in which humans play the roles of animals. One of the actors is Achilles, who plays the role of the hare. Another actor is Paris, who plays the role of the tortoise. Achilles, however, is under the mistaken impression that another third actor, Hermes, is playing the role of the tortoise. And the conversation participant knows this. Given this scenario, when our example sentence comes along in the discourse the cognitive configuration has already been set up as shown in Fig. 2.14.

B is the Base, with current information in the conversation about the real-life actors. P is a space subordinate to B, with current information about the play. M is set up relative to B, with information regarding the beliefs of Achilles. And Q, subordinate to M, is structured to reflect current information about Achilles' beliefs concerning the play. Two connectors operate: Identity 3, and Drama 2, which connects actors and characters.

This richer configuration offers more ways for the Access Principle to operate. When the target sentence Achilles believes that he is faster than the tortoise comes into the discourse, it puts either M or its subordinate Q in focus. This leaves several construction possibilities compatible with the incoming sentence:

1) If Viewpoint is from the Base, and Focus on Q, the tortoise can identify c2 in Q directly, while Achilles names a, and thus provides access to its counterpart a2, via the connection from B to M to Q (connection 5). That will yield the additional internal structure in Q:

    FASTER a2@c2

...
(2) If Focus is on the belief space M, the description the tortoise for c₂ in Q can be used to access the counterpart of c₂ in space M, namely c', while the anaphor he accesses a'. The corresponding additional structure for space M will be:

\[ \text{FASTER a'c'} \]

This reflects Achilles' belief that he is faster than Hermes. But notice the subtle shift in viewpoint: it reflects this belief of Achilles through Achilles' (mistaken) view of Hermes as the actor playing the tortoise.

(3) If the Viewpoint is now P ("the play") within the Base, and the Focus is again on M, the belief space, then b' may be accessed through its counterpart b₁, yielding the structure:

\[ \text{FASTER a'b} \]

This time, the belief reflected is that Achilles is faster than Paris.

(4) Because comparatives can operate across mental spaces (Fauconnier 1985), the following interpretations are also available:

\[ 4': \text{FASTER a'c}_2 \] [Achilles thinks that he (the human) is faster than the tortoise in the play.]

\[ 4": \text{FASTER a'b} \] [The speaker evaluates the speed of the tortoise to be x and the speed which Achilles believes himself to be capable of to be y, and says that y is greater than x.]

(5) Now this may seem like an already large number of interpretations, but it is only the subset of interpretations available for the sentence relative to the special space configuration corresponding to the imagined situation.

In the spirit of autonomous semantics and logic, consider the wider question: What are the constructions compatible with our sentence, within a four-space configuration with two connectors? The answer is many. The definite description the tortoise could describe elements in M or Q or B or S or connector O. I will not attempt to go through the tedious list of combinations, which involve a tortoise in the real world, beliefs of Achilles and to whom that tortoise is, fictional representations of the (real) tortoise in the play, viewed either from Achilles' point of view or from the speaker's, the real tortoise playing the role of other animals in the play, and so on.

The bottom line is this: because of the many spaces a description may originate in, because of the many ways in which counterparts may be accessed, a given sentence does not have a fixed set of readings; rather, it has a generative potential for producing a set of interpretations with respect to any discourse mental-space configuration. The referential opacity/opacity distinction noted by scholars is but one very special and very simple case of this potential: the case in which the number of spaces is limited to two, and in which the sentence contains an explicit space builder for one of the two spaces. When the notions of role and value are brought in, the number of configurational possibilities increases even further (cf. Fauconnier 1985, 1986; Sweetser 1990b; Sakurai 1996).

3.3. Scope of Indefinites

In the same way that sentences are grammatically underspecified as to the origin of definite descriptions (the mental space of the named element), they are also typically underspecified as to where an indefinite description introduces a new element. So if the kind of situation imagined above gives rise to the sentence

Achilles believes he will catch a rabbit

the grammar tells us that a new element d fitting the frame Rabbit is set up, but it does not specify in what mental space.

Here are some interpretations corresponding to different choices for insertion points:

- Insertion directly into W, the future mental space set up (by will) relative to M: d has no counterparts in any of the other spaces. The rabbit is completely non-specific. We are not talking about any particular rabbit, either in reality or in the play, nor does Achilles have any particular rabbit in mind; there are still two subinterpretations, however, depending on whether the insertion is in W only, or in the subspace Q of W associated with future events in the play. Insertion of d into the Base, with a counterpart d' in W; this is one of the "specific" readings, where the speaker commits herself to the existence of the rabbit, about which Achilles has certain beliefs (including, perhaps, that it is a hare, or a tortoise, or ...).

- Insertion of d into P (the "play" relative to the base); the relevant counterpart of d in Q (Achilles' beliefs about future events in the play): The play, as understood by the speaker, has a character which is a rabbit, and we are talking about Achilles' beliefs regarding future events in the play involving that character and the one played by Achilles. Achilles does not have to believe that this rabbit is a rabbit (i.e., the counterpart of d in Q can fit into frames different from the ones for d in P).
• Insertion of d into M (Achilles' belief space), with a target counterpart d' in the future-belief space W: Achilles, this time, does have a rabbit in mind, and has future beliefs about it.

• Insertion of d into Q (Achilles' view of the play), with a counterpart in Q' (Achilles' beliefs about future events in the play): Achilles, this time, does believe that one of the characters in the play is a rabbit (and he could be mistaken, from the speaker's standpoint), and the sentence is about beliefs that Achilles holds concerning his own character (the hare) and the rabbit character.

There is nothing vague about the number of such interpretations: It is a function of the number of spaces already set up, and their accessibility relations. The crucial point, which has been stressed over and over again in mental-space research, is that underspecification combined with the Access Principle yields all the traditional scope distinctions in simple cases, and yields far more in the general case. Contrary to traditional scope analyses, the number of interpretations exceeds (in principle) by more than one the number of operators explicitly mentioned in the sentence (in our example, believes and will).

3.4. Presupposition Projection

Natural languages have grammatical devices for marking some of the internal structure of mental spaces as presupposed. This is a powerful expressive feature because it allows structure to be propagated by default through the lattice of mental spaces built up as part of an ongoing discourse. As a result, large amounts of structure are added with a minimum of explicit lexical information. Grammatical presuppositional constructions include definite descriptions, factivity, clefts and pseudo-clefts, aspektual verbs and adverbs, and iteratives.

The king of France is (not) bald presupposes that there is a king of France (definite description). Hilda knows (doesn't know) that her son is a thief presupposes that Hilda's son is a thief (factive). It was (not) Romeo that Juliet loved presupposes that Juliet loved someone (cleft construction). Luke stopped (didn't stop) smoking presupposes that Luke smoked. Chicago defeated Oakland too presupposes that another team defeated Oakland, or that Chicago defeated another team than Oakland (iterative).

Over the years, the problem of presupposition projection has received extensive attention and given rise to extremely interesting work. In traditional terms, the projection problem is about sentences: When do presuppositions of embedded clauses give rise to presuppositions of the entire sentence? Work in Schiebe (1975), Dinsmore (1981, 1991), Fauconnier (1985/1994) shows that we are dealing with a discourse phenomenon, and that a more satisfactory way of posing the problem is to ask how information grammatically introduced as presupposed relative to one mental space can be either propagated to other spaces or blocked from being propagated.

We can improve on previous formulations of Presupposition Float by invoking the following general principle:

**Presupposition Float**

A presupposed structure Π in mental space M will propagate to the next higher space N, unless structure already in M or N is incompatible with Π, or entails Π.

Informally: A presupposition floats up until it meets itself or its opposite.

To say that a structure "propagates" from space X to another space Y is to say that, if it is satisfied for elements x, y, ... in X, it is satisfied for their counterparts x', y', ... in Y, via some connective C. As usual, we find structure mappings involved in matching processes that transfer structure.

So consider, for example, a familiar case like:

She believes Luke has a child, and that Luke's child will visit her.

The space building proceeds roughly as follows:

Base B: elements a (name Sue), b (name Luke)

Future Space M, introduced relative to B: new element c, counterpart b', via the Identity Connector Ω, new structure CHILD c b'.

Future Space W, introduced relative to M: counterparts a'', b'', c'', for a, c, new structure VISIT c'' a'', presupposed structure <b'' HAS CHILD>.

This structure is grammatically marked as presupposed through the use of the definite construction (definite article the).

The Presupposition Float Principle prevents this presupposed structure from floating up from W into M, because explicit structure in M (CHILD c b') already entails <HAS CHILD> for the counterparts c and b' in
M of c' and b" in W. Because the presupposition does not float up to M, it cannot, a fortiori, float up to the Base: it has been halted at the W level. This ensures that the piece of discourse does not globally presuppose (or entail) that Luke has children.

Notice that although the presupposition does not float all the way up, it is not canceled: It remains in force at the W level. This is important in principle: A presupposition will float up into higher spaces, until it is halted. It will then remain in force for the mental spaces into which it has floated. In other words, inheritance is not an "all or nothing" process. The general issue is: What spaces inherit the presupposition? The vast literature on presupposition projection typically limits itself to asking if the "whole sentence" inherits the presupposition. In our terms, this amounts to asking if the Base Space of a minimum discourse configuration inherits the presupposition, in other words, if the presupposition floats all the way up. To account for the full range of semantic entailments, this is insufficient; the more general question has to be answered: How far up does the presupposition float? The answer to the general question, given by the Presupposition Float Principle, will of course subsume the answer to the special question: Does it float up to the Base?

Now, consider a related example:

Jane hopes that Sue believes that Luke's children will visit her.

An additional space H (set up by Jane hopes, relative to B) serves to launch M. The presupposition <HAS CHILDREN>, satisfied for b" in M, will float up freely into H and then into B. This amounts, for the speaker, to assuming that Luke has children, and that Jane and Sue assume that Luke has children.

But it is essential to note that even though this type of Spreading is warranted by the minimal discourse that could be associated with this sentence, it could be canceled by either prior or later discourse. Our example sentence could occur in a discourse where it is already assumed that Luke has no children or that Jane thinks he doesn't. Then the presupposition would be halted at the B level, or at the H level, by incompatible preexisting structure. In other words, the default case here is for the presupposition to spread all the way up, but the sentence is perfectly compatible with a discourse preventing or canceling some of that spreading. This may happen under pressure from later discourse, where we are told that "in fact" Luke has no children. The construction will be maintained, except for the floating into B, which is now superseded by stronger explicit information.

In terms of processing meaning construction, this observation raises some key issues: It means that some aspects of the constructed space configurations are more stable than others. Specifically, the structures that have been obtained implicitly (e.g., through Presupposition Float) must be stored as cancelable, at least in the short term.

Finally, notice the possible interplay of Float with Access. It was assumed, in discussing the previous example, that the expression Luke's children had introduced structure directly into the bottom space M. But, as we saw in section 2.3.2, it could equally well describe an element in a higher space, B or H, which would then serve to access a counterpart in M. This yields possible interpretations for the sentence, in which the speaker and Jane, but not Sue, assume that Luke has children, or in which the speaker only, but neither Jane nor Sue, is assumed to assume that Luke has children.

As noted in Fauconnier (1985/1994) and Kay (1992), other types of presupposition can be used in this way to provide access from the top rather than floating from the bottom. Very generally, the underlying forces in the discourse construction have the aim of spreading structure across spaces, using minimal linguistic effort, through powerful default procedures. We find that Spreading happens in both directions: top to bottom (through Access), and bottom to top (through Floating).

The Presupposition Float Principle handles in a very general way examples that have proved troublesome in presuppositional analysis. For example:

If John has children, then John's children are bold.

The if...then construction sets up a hypothetical (foundation) space relative to the base B, and an expansion space E relative to H (see chapter 5 for details). In H, the information that John has children is set up nonpresuppositionally (John has children). In E, it is set up presuppositionally (John's children). The presupposition floats from E into H and "meets itself" in space H. It cannot float up any higher. It follows that it will not be propagated to the Base. This correctly reflects that the sentence as a whole does not presuppose that John has children, as opposed to—say—if John is here, then John's children are in New York. Another familiar example discussed by Soames (1982) is:

Oakland beats Montreal, Chicago will beat Montreal too.
The iterative too brings in the presupposition \( \Pi \) in \( E \) that a team other than Chicago has beaten Montreal. \( \Pi \) is entailed by the nonpresuppositional structure in \( H \) corresponding to Oakland beats Montreal, and therefore does not float up to \( H \). The sentence indeed does not presuppose that any other team has yet beaten Montreal.

It should also be noted that space partitioning does not reflect "the world," but rather discourse information about the world at various stages. Spaces will reflect what is known or not known. For example, a form \( \text{Either A or B} \) will set up two spaces relative to the Base, which must both be compatible with the Base (i.e., with current knowledge at that stage of the discourse). This means that the new structures set up by \( A \) and \( B \), respectively, are each compatible with the Base structure, even though they may be incompatible with each other. Consequently, if \( A \) carries a presupposition \( \Pi \) that is incompatible with \( B \), that presupposition will not float up to the Base: this is because the Base is constrained (by the semantics of \( \text{either . . . or} \)) to be compatible with \( B \)-structure; this makes \( \Pi \) incompatible with the Base and prevents it from being inherited, by virtue of the Presupposition Float Principle.

To illustrate, consider the standard example:

\[ \text{Either Luke just stopped smoking or he just started to smoke.} \]

One disjunct has the presupposition that Luke was a smoker, the other that he wasn't. Incompatibility with the Base prevents such presuppositions from floating up.

As Soames (1982) has shown in detail, examples like the ones above, and many others, cannot be integrated into a coherent treatment within the sentence-based accounts typically proposed by combinatorial or cancellation approaches to the projection problem (e.g., Karttunen 1973; Karttunen and Peters 1979; Gazdar 1979).

Mental-space analysis offers a uniform, general, and broader account of presupposition phenomena. Furthermore, the account is principled, because it relates presupposition projection to the structure-building process of Spreading: maximizing the amount of structure introduced with respect to the linguistic means employed.

### 3.5. Grammar and Meaning

The examples briefly reviewed thus far show that linguistic form plays a role in meaning construction that goes far beyond the assignment of satisfaction conditions. The next chapter, dealing with tense and mood, will look at yet other intricate ways in which grammar prompts the construction of appropriate space configurations and viewpoints. The following general aspects of the meaning and form association are noteworthy.

1. **A language expression can do many things at once.** The Achilles sentences we looked at open spaces, set up new elements, structure spaces internally, and connect spaces to others in the space configuration. This is one important difference between sentences and logical formulas, which only specify satisfaction conditions within a domain. It is one reason for the difficulties encountered in trying to reduce sentences to logical forms; even though an important function of sentences is indeed to specify satisfaction conditions, it is only one of several functions, and it may target more than one space at the same time.

2. **The effect of a language expression depends on the space configuration it operates on.** The space-building instructions associated with particular grammatical constructions are unique. For example, in English:

\[ aN \]: set up a new element that fits the frame called up by \( N \).

\[ \text{NP}_1, \text{BENP}_2 \]: connect the elements identified by \( \text{NP}_1 \) and \( \text{NP}_2 \), respectively. (\( N \) is a noun, \( NP \) a noun phrase.)

But the effects of such instructions may be widely different, depending on the configuration they operate on when they come into the discourse. A new element will have three places to go to if three spaces have already been set up at the discourse stage where the indefinite description comes in; it will have only one if the Base is the only space in the configuration. \( \text{BE} \) will connect spaces differently depending on what connectors (space mappings) are active at the relevant discourse insertion point. There are multiple possibilities for instantiating language instructions; this important aspect of meaning construction is explored in some detail in Mental Spaces (Fauconnier 1994). The multiple possibilities do not stem from structural or logical ambiguities of the language form; they stem from its space-building potential: The language form contains underspecified instructions for space building. It can apply to infinitely many kinds of input; and for any given input there is a finite number of outputs that it can yield.

3. **Language expressions underspecify cognitive constructions.**

This point is related to the previous one; there will typically be many
configurations formally compatible with the space-building instructions carried by grammatical constructions. They will be partly resolved by pragmatic considerations involving strategies such as noncontradiction, relevance, prototypicality, default options, and so on.  

4. Some logical properties of sentences in isolation are really special cases of their potential for space construction. For example, the so-called de re/de dicto and specific/non-specific ambiguities are a simple consequence of the general Access Principle, when restricted to the case of two spaces set up by the same sentence.

4. Truth, Reference, and Pragmatics

4.1. Ambiguity, Intensionality, and Discourse Configurations

The initial and important reason for studying space configurations was that they provide general answers to puzzles of language and meaning that are usually associated with sentence logic. When a sentence is looked at in isolation, we come up with the typical interpretations for that sentence, and we try to match up the sentence with logical forms (or representations) that will account for the observed “meanings.” But when a sentence is correctly understood to be making an overall contribution to cognitive discourse construction, we find that the same “meaning,” conceived of as building instructions, can give rise to different “interpretations,” depending on what existing configuration such instructions are applied to, and how they are applied; the “how” comes into play because the building instructions typically underspecify the construction: There can be more than one way to elaborate an existing configuration in conformity with the instructions carried by the linguistic form of the sentence.

There are two important consequences: (1) The logical properties of isolated sentences follow from the general principles for building configurations; and furthermore, logical properties that are not apparent in isolation but emerge in full discourse are also accounted for.

14. To say this, however, is not to resolve the incredibly difficult problem of how, in practice, strategies are chosen. In fact, although pragmatic factors reduce available choices considerably, participants in communication often choose different strategies, and there are far more misunderstandings than we are usually aware of. The misunderstandings get noticed only when they lead to serious clashes of relevant and clearly visible entailments.

2. Logical forms commonly assigned to isolated sentences correspond to observations that a philosopher, a logician, a linguist, is liable to make, but they are not representations within the theory itself. They are derivable from the theory, insofar as they correspond to special cases of space configurations. The bound variables of logic and linguistic anaphors (pronomes in particular) are similar in some ways, but very different in others. The space elements, on the other hand, which are independently responsible for the existential quantifications, behave consistently as a basis for anaphora, regardless of what spaces they happen to be in.

This last point can be emphasized: It is a constant assumption throughout this work that grammar is cognitively motivated and, correspondingly, that understanding grammar in its context of use (rather than in purely autonomous structural terms) will yield insight into cognitive organization. Simplicity arguments follow from this general assumption: We seek links between cognitive constructs and grammatical features that are as direct and general as possible, and we see such simplicity, directness, and generality as counting heavily when evaluating any analysis.  

4.2. Truth and Reference

In the configurations we looked at, frame properties were assigned to elements. This is not the usual sense for the notion of property: properties like “tortoise” hold of entities in the world, not of cognitive constructs (like “element a”). But it is also noteworthy that we can understand discourses like the ones above in the absence of actual entities (real tortoises and the like) being referred to. How is this possible? How can configurations relate to the real world and to the way that we apprehend it?

Our folk theories are relevant here. When we talk, we assume that there are indeed objects and properties in the real world and that, given an object and a property, there is a fact of the matter as to whether the object has the property or not. Now, take any space in which an element a is assigned property P. Suppose we link a with real-world object A. P(a) counts as “true,” under that matchup, if object A has property P.

15. Strangely, within linguistics and philosophy of language, this commonsensical scientific guideline is sometimes missing. Indirect or convoluted solutions have some appeal, perhaps because the search for an autonomous language faculty triggers a kind of reverse Occam’s razor effect.
and "false" otherwise. It does not matter whether we have or think we have an actual procedure for checking that properties hold of objects. All that matters is the assumption that there are objects and that, in some deep absolute sense, they have or do not have the properties we consider. It does not directly matter, either, whether or not this assumption itself is right as long as its commonsense credibility is sustained. And this credibility is certainly sustained for common objects and properties that we deal with in everyday life.

What counts here is the social consensus on objects and properties in various situations. When presented with a kettle, say, and asked about its color, we do not, outside of philosophical circles, ask whether there is really an object there that everyone is referring to, or whether it makes any sense to predicate the property "black" in such a situation. We simply concur in identifying an object and assume that it is either black or not black. Yet, as Charles Travis (1981) shows in great detail, the actual conditions under which the very same kettle might count as black or not black are a complex function of the context; realistically, there are no absolute properties. Again, this does not matter for the purpose at hand: It is sufficient to assume that if a cognitive space were matched up with real-world objects and relations, the interpretation conditions of the type Travis discusses would also be given, so that there is a fact of the matter as to whether the space fitsAT the "real" situation.

Once we have this type of implicit assumption, spaces take on "meaning" in the realistic sense: Given a matchup of space elements with real-world objects, relation specifications within the space will be either true or not true.

Remember that all this is independent of the much harder question of how we actually connect configurations to real-world situations. A "property" that shows up in cognitive constructions is really part of an ICM ("idealized cognitive model"),16 and such ICMs are matched to the real world in complex ways. What counts here is only the idealized assumption that, in a given situation and for a given matchup between elements and real-world objects, the space fits or does not fit the situation, in the sense that the objects have or do not have the properties assigned to the space elements associated with them. How people achieve (or try to achieve) social and psychological consensus on such matchups is another matter.


Once this theoretical matchup possibility is granted, we can turn to a more intriguing feature of the space configurations: They can be manipulated, operated on, and so forth, in the absence of any actual particular matchup. This is why we can process and "understand" a minidiscourse like the one in section 2.3.2 in the absence of any real person called Achilles, or of any real tortoise, hare, or rabbit. We can understand the "content" of Achilles' belief even if we have no precise idea of what a tortoise looks like, simply by assuming that property F ("tortoise") is in fact one that applies or does not apply to given entities. We may have many ideas about tortoises, in the sense that we associate many other properties with property F, but it doesn't really matter that participants in a discourse like the one in 2.3.2 might have wildly different networks of properties associated with F, unless such properties happen to contribute to the explicit inference production in the discourse; then there can be arguments, misunderstandings, disagreement, and so on, among the participants.

The manipulation of space configurations in the absence of a real-world matchup would be no more than a solipsistic exercise were it not for the crucial implicit assumption that we know in principle how to match worlds with configurations. The tricky part is that this is an assumption we make when we talk and think, an assumption that is socially essential, but also one that is not factually supported by our behavior.

In the rest of this book we shall encounter many cases of space constructions that are not intended to serve in direct matchups with the real world but can nevertheless yield important real-world inferences. One of the motivations for such constructions is to link new domains with existing ones, so that some of the known logical structure of the existing domain can be exported directly into the new one. This is a powerful, nondeductive means of producing large classes of inferences that can be used in a particular context and situation. It is also a way of structuring an understanding of a particular discourse situation.

To sum up, truth and reference are far from absent in the overall theory of space configurations; because spaces contain elements with assigned properties, they have a potential for acquiring real-world truth values under specific matchups of elements with objects. And yet the configurations can be operated on to yield inferences and additional structure without instantiating any of the potential matchups.

One suspects that this feature of space construction is a major factor behind some unusual aspects of human creativity. When language is
narrowly limited to its information-carrying function, there has to be a
matchup: Giving correct information is to refer to things and beings, and
to say something true about them. But for most other uses, for instance,
scientific and literary imagination, social interaction, argumentation,
proof and persuasion, poetry, swearing, potential reference is sufficient.

4.3. Pragmatics

Mathematical formulas are designed to give structural information
explicitly and unambiguously. As a result, each mathematical formula
gives comparatively little information, but does so quite thoroughly.
Language expressions, in contrast, seem designed to yield huge amounts
of structure. This happens in the following way: Some words and grammati-
cal constructions bring with them an array of background knowledge,
including frames, cognitive models, default assumptions, encyclopedic
information; pragmatic functions are signaled by words like be; as be
does not identify the particular function or mapping, it is inferred on
the basis of context plus background knowledge and models; similarly,
expressions like the one studied in Chapter 1, section 2.2.3 (I can't catch
up with myself) bring in complex mappings and connections for their
interpretation, even though such mappings are not indicated by the words
in the sentence; when spaces are set up relative to other spaces, default
structuring processes like optimization operate to provide structure not
explicitly indicated; presuppositions introduced in one space float up
through adjacent spaces; extensive projection mappings (Chap. 1, sec.
1) are also set up, using very few words: a metaphorical connection sig-
aled by just one of its connected pairs will project one entire domain
onto another, not just the members of the pair; finally, rich sets of im-
pli catures come into spaces along with the frame-based relations that
are explicitly specified; constructions are often set up for the purpose of
bringing in such implicatures.

All these diverse kinds of structuring contribute to building up a space
configuration, and new sentences that come along in the discourse
typically take such prior construction into account:  For example, words
like but cancel implicatures, pronouns may identify elements introduced
covely into spaces by optimization, words like therefore signal deductive
relationships that may not have been explicitly stated, and so on.

Much of this is pragmatics. Space configurations are built up seman-
tically and pragmatically at the same time. There is no configuration

corresponding only to the semantic information that would later be
patched up by the pragmatics. Incidentally, this does not imply that the
division between pragmatics and semantics disappears. We are free to
call some of the processes involved in the construction semantic and
others pragmatic; but there will not be any separate representations in-
volved. The isolated sentences have a semantics in the sense that they
provide instructions for space construction. Their actual contribution to
a particular discourse will depend on the configuration that is built up
for that discourse; because much of the contribution from a particular
sentence will usually depend on its conjoined action with other features
of the construction, there will not be, in the present approach, anything
like the specific "content" of an expression separable from the rest of
the construction.