3 The Wall

3.1 The fascination of universal sememes

As mentioned in the previous chapter, I was part of a machine translation project that began in 1970. We were part of the linguistic camp that believed in the importance of using a comprehensive model of syntax, and our model was Junction Grammar, developed by Eldon Lytle, the project director. In fact, the project was at least in part a test of Junction Grammar. As we saw in the previous chapter, by 1960 people like Bar-Hillel were claiming that there is a wall between human translation and machine translation; and in terms of performance on unrestricted text, there is now general agreement that such a wall exists. But what kind of wall is it? Where does it come from? Can it be taken down? Throughout the rest of the book, the wall metaphor will evolve as we discuss language. I will begin by discussing my personal encounter with the wall during the 1970s. The wall has turned out, to my surprise, to be more durable than the Berlin Wall.

When our machine translation project began, I was blissfully ignorant of any wall between human and machine translation. We were still using punched cards on an IBM mainframe, and I was focused on the hill we carried our cards up each morning to get to the computer center. Tired of returning in the evening to see the results of our daily computer run, we soon discovered an alternative, the VM/CMS operating system, which allowed us to interact directly with the mainframe using video display terminals. Not only did this allow us to be much more efficient in programming, it also opened up the possibility of on-line interaction with computer programs, which is familiar to everyone today who uses a personal computer, as opposed to the previous **batch** mode. We were translating from English into several target languages; so the cost of analyzing the English source text could be shared over several target languages. By then we had already bumped up against the wall; but we did not recognize its importance and hoped that on-line interaction would get us over the difficulties.

The interactive process of analysis consisted in running a computer program that attempted to analyze the source text but paused whenever an ambiguity was detected, displaying a question on the computer terminal and waiting for a human to answer it. The human answering the questions was an English monolingual with some training in Junction Grammar; therefore, no questions requiring any knowledge of the target language were permitted. The questions were of two types, syntactic and word-sense.

Syntactic questions involved aspects of Junction Grammar. Some ambiguities were easy to state and to answer, such as where a prepositional phrase attaches in a sentence (e.g., in the sentence "I saw the girl with a telescope" the prepositional phrase can attach to 'girl' or to 'saw', depending on whether the girl has a telescope or someone used a telescope to see the girl). Other interactions were more subtle, such as the possibility of attaching a modifier to several different points within a noun phrase or verb phrase, with point of attachment having semantic implications.

Word-sense interactions were of an entirely different nature. Here Junction Grammar gave us no clear guidance. Neither did we have much guidance from other machine translation projects. All machine translation projects, from the early 1950s on, recognized the importance of resolving categorial ambiguity. As indicated in the previous chapter, this process has traditionally been called homograph resolution in machine translation circles. For example, the ETU 'open' can function as a verb or an adjective ("We will open the case of oil" versus "We will keep the open case"). Clearly, resolving ambiguities of grammatical category is necessary in machine translation, but just as clearly, this simple categorial resolution is not always sufficient to determine the proper target language word. For example, the word 'beam' has several distinct noun senses, such as "beam of light" and "a beam of wood". It is not likely that these senses will translate as the same word in all target languages; thus, categorial resolution is insufficient, and the computer cannot simply look at the next few words since an ambiguous word such as 'beam' will often be used without a prepositional phrase. When a word with multiple senses was encountered, the machine translation system attempted to resolve the categorial ambiguity automatically, but when a word had multiple senses within a category, the program presented a list of definitions to the English monolingual to choose from and waited for a reply.

Other machine translation projects had of course encountered these same problems, but the other projects were different in design and objectives from ours. They were usually translating technical documents. In order to increase the chances of the computer making the right choice, the designers allowed the

user to select among several technical dictionaries when a text was translated, with each dictionary tailored to a particular subject matter domain, such as chemical engineering or nuclear physics. Within each technical dictionary, a term was given just one translation, the one most likely to apply to documents specific to the domain in question. In case a document dealt with several domains, the user could even specify that several technical dictionaries should be consulted in a particular order. As we saw in the previous chapter, the Systran system had only one general translation for each word, but it was only used when the word was not found in any of the technical dictionaries specified for use during the translation of that text. This method was surprisingly effective when applied to documents within a very narrow domain. In contrast, we were translating rather general documents, often ranging over several topics within a single text, so we did not have the luxury of using a domain-specific approach. Also, most other projects were committed to a design in which the machine translation phase was automatic and produced translations that were as good as was feasible under that constraint, with the hope that their quality would gradually improve and the assumption that post-editing would be used as needed. Again in contrast, we were committed to producing high-quality output, even if this required a large number of interactions at first, with the hope that the number of interactions per sentence would gradually be reduced without sacrificing quality.

At first we thought we were alone in using the interactive approach, but soon we ran across an article by Martin Kay (1973) which reported on his implementation of interactive translation in a small system. With this and other encouragement, we pursued our attempt to develop a large-scale system for producing interactive high-quality machine translation of unrestricted text. Little did we know what awaited us.

Preparing a dictionary for interactively resolving word-sense ambiguities seemed at first to be a well-defined task, at least as well defined as the senses listed in a good dictionary. But questions quickly arose. For a given word and a given grammatical category, which word senses should be listed as options? Should they be tailored to the various translation equivalents in the target language? Tailoring was not acceptable since there were several target languages in our system, with the possibility of adding more at any time. Here I must mention an additional design requirement based on economics. Since we anticipated that interaction during analysis would be expensive, we wanted to be able to do it once for a given text and then re-use the results of analysis, sometimes much later, to translate automatically into several target languages, including target languages that were not yet part of the system. Therefore, the

obvious approach was to identify all the possible concepts onto which a given word can be mapped. In order to build analysis dictionary entries that would not have to be redone (except to add new concepts as the language evolves) and to avoid having to re-analyze an old text even in that case, we decided to use only language-independent concepts and to assign a unique number to each of them. Then, we could map each universal, language-independent concept, which we called a **sememe**, onto just one word (or a small cluster of grammatically conditioned words) in any target language we chose to translate into.

Although the search for language-independent concept numbers now sounds to me misguided, twenty years ago we were extremely serious about the endeavor and convinced of its eventual success. So we embarked on more than five years of concerted effort to write an interactive Junction Grammar analyzer, to build up an analysis dictionary that incorporated many word senses which we hoped came from the language-independent universal set of sememes, and to write transfer/synthesis programs into several languages. Although we believed that the syntactic relations in Junction Grammar were rich enough to represent the structure of any sentence in any language, we did not pretend that our syntactic diagrams were language independent. Therefore, we did not have a true **interlingua**, that is, a language-independent intermediate representation, yet we did not find it strange to expect our sememe numbers to be language independent.

I remember a conversation with Richard Kittredge during this period (the mid-1970s). Kittredge was the director of the machine translation project at the University of Montréal, the TAUM project, and he suggested that our project was overly ambitious. I assured him that thanks to the power of Junction Grammar and the technique of using human interaction for the moment (with the goal of gradually reducing it to a negligible level or better yet, eventually eliminating it through intelligent programming), we were guaranteed to achieve success. I am now embarrassed when I recall this conversation.

Why did it seem so natural to me and to others who were working on the BYU project to attempt to write definitions which corresponded directly to both word senses and universal sememes? Recall from chapter 1 that the Western belief in a stable transcendental meaning, which is the basis for universal sememes, can be traced back many centuries, and that the shift away from stable transcendental meaning began only in this century with Saussure. Since Saussure and his contemporaries we have been in a confusing period of abandoning old ideas while not being satisfied with new ones, and often holding contradictory views simultaneously. Perhaps I can explain my

willingness to believe in universal sememes by noting that Descartes, a great mathematician as well as a philosopher, found it worthwhile to try to do exactly what we were attempting to do with our dictionary of correspondences between words and sememes. Karen Sparck Jones (1986:211) cites Descartes who, in a letter to Pierre Mersenne dated November 20, 1629, described a proposed universal language built up from a basic set of "clear and simple ideas". Each basic idea would receive a unique numeric code; texts written in these codes would supposedly be understandable to anyone possessing a code book for the language. Later, in a well-known effort, Leibniz continued the search for a universal language. If minds as great as Descartes and Leibniz believed in what we were attempting, why should I be ashamed of our efforts?

3.2 Hitting the wall surrounding domain-specific machine translation

The syntactic side of our project went well. Junction Grammar developed into a coherent, fairly comprehensive model of the syntactic structure of language (Lytle 1974 and 1980; Melby 1980 and 1985), and many Junction Grammar insights have since occurred to others and have been incorporated into mainstream syntactic theory. The word-sense side was a disaster. As the dictionary got bigger and bigger and we ran more and more texts through the analyzer, it became harder and harder for native speakers of English to decide among the word-sense options listed for a given word. Often, they would say that a word was used with a sense somewhere between two listed senses but not right on either one. Often, they would say that an entirely new sense was needed, not like any on the list. And often, even if they chose a word sense from the list, the transfer/synthesis program would not produce an appropriate target-language word. The transfer/synthesis designers would complain that the analysis people were not choosing word senses consistently; the analysis people would complain that the dictionary writers were not doing their job; and the dictionary writers would explain that they were doing their best. It was a frustrating time, because no one could come up with a single example of a sentence that could not be handled perfectly—in hindsight, that is. Let me explain. Given a sentence that did not translate correctly the first time through the machine translation system, a diagnosis was made to identify the nature of the problem. Sometimes the sentence had been assigned an incorrect syntactic structure, and the analysis grammar team fixed the problem. Sometimes a sememe was mapped onto the wrong word in the target language, and the transfer/synthesis team fixed the problem. Sometimes there was a word in the

English source sentence for which there was no definition in the analysis dictionary that corresponded exactly to the meaning of the word in that sentence of the source text, and the analysis dictionary team fixed the problem. Every problem could be fixed, but the system usually failed on the next sentence presented to it. We did not know it at the time, but it was a form of the tuning problem that has been encountered by most, if not all, machine translation projects. There is no problem that cannot be fixed, yet you are never sure you have finally got it right.

By 1978, we had reached a crisis. We had hit a wall we could not get over. The system was not working (that is, the unfortunate need for heavy post-editing was recognized) and drastic action was in order. Some favored adding interaction to the transfer phase. But this was not an acceptable solution to me, since it required a bilingual human (actually, a qualified translator) for each target language (creating an economic problem) and since it did not answer the question of how to identify language-independent universal sememes (sidestepping a theoretical problem). This was when it suddenly occurred to me that although concepts certainly exist in some way, the real problem could be that the *language-independent universal sememes* we were looking for do not exist! Seldom in a person's career does such a complete change in world view take place. I had a degree in mathematics. The world was supposed to be a nice, tidy place. It was hard for me to admit that our approach to word senses was dead wrong. It was not just a matter of trying harder. I eventually became convinced that no amount of effort would patch up the system as we had designed it. The universal sememe search had reached a dead end.

My view of language and the world had changed. I had become convinced that what we had been looking for, *the* universal, language-independent set of sememes, did not exist. I started asking myself about the status of sememes. What was the justification for believing in them? It seemed to be an unsupported generalization: just because some terms could be reduced to a limited set of clearly distinguishable language-independent senses, we had supposed that all words could be. But pushed to the extreme, this generalization entails the doctrine of total reducibility of meaning to language-independent atoms, which we had called sememes. When we map all language, not just a few terms, onto sememes, supposing that there are a limited number of sememes that each word can map onto, we leave true creativity behind. All meaning becomes mechanical combinations of atomic word senses. Once this work is completed, we would *theoretically* arrive at the single correct, language-independent, all-encompassing basis for viewing, that is, categorizing

the world, one universal view from which all individual views would be derived. This position has implications which, upon later reflection, I have found horrifying. In the early 1970s, I scoffed at the Whorf-Sapir hypothesis that one's world view is influenced by one's language. Now I have read some of Whorf's writing with interest and respect.

I emphasize that at the time, my objection to the view I abandoned included no high-flying reasoning. What brought down my naive faith was an *intuitive* realization that the search for the final determinate set of sememes was futile, obviously in practice but, I suspected, also in principle. I was beginning to sense that language is more dynamic and ambiguous in a deeper way than I had ever supposed and that there is not just one built-in, correct way to view the world. With no universal world view and thus no universal set of sememes, the basis for all lexical transfer in our machine translation system had disappeared.

The futility of searching for universal, language-independent sememes could explain the failure of *our* project. However, certain other machine translation projects had been successful. Why were they successful? I had already noted differences in approach. Upon comparing their design and objectives with ours, I observed the following that our project had the following design requirements: (1) it must produce high-quality translations (indistinguishable from competent human translations) of general texts; (2) human interaction in analysis was allowed, but little or no post-editing was permissible; and (3) all interaction with the computer must assume an English monolingual human operator. It turned out that no other project anywhere in the world was at that time able to satisfy those requirements; therefore, successful projects must have other design requirements. The crucial difference in design between our project and other projects was that we were not able to restrict the source text to the sublanguage of a single, well-defined domain. There was some kind of wall between sublanguage machine translation and general-language machine translation, but I did not at the time understand the nature of that wall.

3.3 The nature of the wall: two kinds of language

By 1981, the machine translation project had moved off campus, I had decided to stay on campus, and I had begun studying human translation. I was suddenly fascinated by human translation in its own right, since skilled human translators were doing, and had been doing for thousands of years, something

which no machine translation project had been able to do—produce high-quality translations of a variety of general-language texts. I decided to try an inside-out approach. I became a translator, at least in the sense that I passed the accreditation exam (for French into English) and became a member of the American Translators Association. I even did some translation of articles on linguistic theory and contracted with a company to supervise the translation of a software manual into French. I also became very much engaged in the task of designing and programming productivity tools for human translators. The last few years of the BYU project, in addition to working on interactive machine translation (but of a basically different design once interaction in transfer was added in 1978), we also worked on various computer-based tools for translators. The development of these tools, along with interactive machine translation, was pursued off campus at ALPS (later ALPNET) by a group whose core consisted of former members of the BYU project. Another thread of development was pursued on campus and off campus (at LinguaTech) by myself and others. Once again, we ran into an insightful paper by Martin Kay (1980) that showed he was thinking along the same lines we were, and further.

Having been deeply committed to a certain view of machine translation and having been humbled by admitting that that view was in error but not having embraced a new view, I was prepared to see language in new ways. All through this period of the 1980s, in the midst of everyday activities of teaching, research, and software development, I yearned for a better understanding of what was wrong with the idea of a list of universal, language-independent sememes. Gradually, it dawned on me that within a well-defined domain—and I want to emphasize this restriction—one can get away with ignoring questions of universality. Each concept of a domain is normally associated with just one technical term per language. And in a standardized terminology file, each concept often has been assigned a unique number. This was exactly what we were trying to do for general language. So what was the difference? An answer struck me forcefully! *The concepts of a narrow domain and the concepts of general language are of a fundamentally different nature.* At first, this seemed too strange to be true. Technical terms and other specialized terms were thought to be just a subset of general vocabulary. However, on this new view, the general vocabulary of a language would form a language-specific semantic network, and each well-defined domain would have its own network, separate from the general-language network, which may be shared across various languages. In other words, there would be two fundamentally different kinds of network: general-language networks and domain-specific networks. This insight had overwhelmed me by 1989. If

correct, it might explain much about when machine translation succeeds and when it fails. The next few years became a time to look for evidence for or against this general/domain distinction and to explore its consequences. The wall we had encountered between controlled-language MT and general-language MT turned out to be the wall around a domain that defines its boundaries.

3.4 The search for a term to cover both sides

Immediately, I realized that most texts consist of mixtures of general and domain-specific items. I say *item* because *word* does not quite fit technical terms, especially noun-noun compounds, that consist of more than one word. One piece of indirect evidence for a distinction between these two kinds of item came through the innocent search for a cover term for the two kinds. I have colleagues in the world of professional lexicography (makers of general dictionaries) and colleagues in the world of professional terminology research (translators and terminologists), and so I thought it would be a simple matter to talk with both groups to come up with a cover term that could refer to both expressions of general vocabulary (outside all walls) and terms from a specialized domain (inside a wall); that is, items on both sides of the walls around various domains. Not only was it not a simple matter, but in the unsuccessful process of trying to find a cover term acceptable to both, I discovered how different the two traditions are. Lexicographers use 'word', 'headword', 'compound', and 'expression', but terminologists do not. Terminologists use 'term', but lexicographers do not. The terms 'lexical unit' and 'lexeme' were proposed, but were rejected by the terminologists, who view their work as concept-oriented and the work of lexicographers as lexically oriented. I even considered using the neologism 'lexiconcept' suggested by a colleague.[8] I finally gave up and started using Lexical/Terminological Unit (LTU), as introduced in chapter 1. Unhappily, LTU is not a true cover term but rather a composite term. Looking for cover terms for similar items is not too difficult. A cover term for 'rose' and 'tulip' and similar plants is obviously 'flower'. But a cover term for 'rose' and 'hammer' that is not so general as to let in all kinds of other items ('object' would clearly be too general) might end up being a composite (such as 'flower/tool'). Thus, the lack of a cover term for lexical units of general vocabulary and terminological units of a specialized domain (other than a composite cover term such as LTU) suggests a substantial distinction.

An additional piece of evidence for a substantial distinction is the fact that terms are not just a subset of the words of general vocabulary. An unabridged English dictionary, which lists headwords from general vocabulary as well as many specialized terms, may have half a million entries, but there are several million specialized terms in English, many of which consist of two or more words that take on a new meaning as a terminological unit. Given just one hundred thousand words that can be used as one element of a two-word term, there are ten billion potential combinations. Even if only one percent of these potential combinations ever become terms, that is still one hundred million terms. And, of course, terms often consist of more than two words and become acronyms, such as ROM (Read-Only Memory), which can then participate in other terms, such as CD-ROM, as if they were words themselves, making the potential number of terms built from the words of general vocabulary practically infinite. The point is that although many terms are derived from one or several words taken from general vocabulary, they take on a new life and are no longer part of general vocabulary. And some terms, such as the nautical term 'yaw' (to turn abruptly from a straight course), are not even part of general vocabulary. In any case, terms are not a subset of general vocabulary, and general vocabulary is not a subset of the terms of all domains. Lexical units and terminological units are both derived from sequences of characters from the same writing system, but neither is a subset of the other.

3.5 The clay/stone analogy

Before continuing, I must point out that when we look at texts, although we find a continuum, that does not imply the lack of a wall between general vocabulary and domain-specific terms. The wall is not between two radically different text types but between the two types of LTU. Texts contain various mixtures of lexical units and terminological units. Suppose we think of clay and stone as physical materials somewhat analogous to lexical and terminological units. For this analogy, I am thinking not of the kind of clay that hardens overnight but the kind that remains pliable. For stones, I am not thinking just of granite or sandstone but also of precious stones such as sapphires and rubies, all of which were formed out of other substances by various processes. A word is thus a chunk of pliable clay and a term is a hard stone. One can think of a stone as a blob of clay that has become transformed into a solid object through some chemical process, just as a terminological unit

receives a fixed meaning within the context of a certain domain of knowledge. Starting with the extremes, a text that consisted solely of general vocabulary would be a sequence of pieces of clay all molded together. The particular sequence of shapes may never have occurred before, even if the same words occurred previously, since the words are dynamic and their meanings shift in different situations, just as the shape of a piece of clay changes as you work it. On the other hand, a text from a very narrow domain, such as the domain of weather bulletins mentioned in chapter 2, would be mostly a sequence of stones, consisting almost entirely of terms, with little general vocabulary, just enough to hold the stones together, and no dynamic usages. No literary creativity is needed, even if the particular weather bulletin has never been issued before. Each term has a fixed and consistent meaning. Granted, terms receive new meanings over time, but not for the purposes of literary effect in a single sentence. In the United States, **storm watch** and **storm warning** are used consistently from bulletin to bulletin, just as one would want them to be.[9] In the far extreme case, even prepositions and other function words can be considered terms when they are highly restricted in their allowed usage.

The two extreme cases, texts consisting solely of general vocabulary and texts consisting solely of terms, are rare. In between the two extremes, there is a vast territory of **LSP** (**Language for Special Purposes**) texts, which consist of a mixture of clay and stones. It is also clear that some LTUs are in between soft clay and hard stone, such as terms that are not yet stable and words that are *recycled* terms (such as 'interface'), just starting to be used in general language again but in new ways. But this state is relatively rare and, more important, *unstable* in that *in-between* LTUs tend to fall off the wall and become either words or terms rather than remain something in between. Thus the wall could also be viewed as a *zone* charged with some kind of force field that tends to push an item to one side or the other. However, a particular sequence of letters (such as *i-n-t-e-r-f-a-c-e*) can be a word in one situation (referring to the way people relate to each other) and a term in another situation (referring to a conversion of computer data between formats).

In my view, the continuum between a very general text and a highly domain-specific text is *not* a gray scale along which words gradually become terms and terms gradually become words (see figure 2). The ratio of the mix may change gradually, but usually words are words and terms are terms, and different processing applies to each. The two analogies, a gray scale versus a clay/stone mixture, have very different implications for the computer processing of language. A gray-scale analogy would imply that techniques applicable to terms can gradually be extended to apply to words. A clay/stone

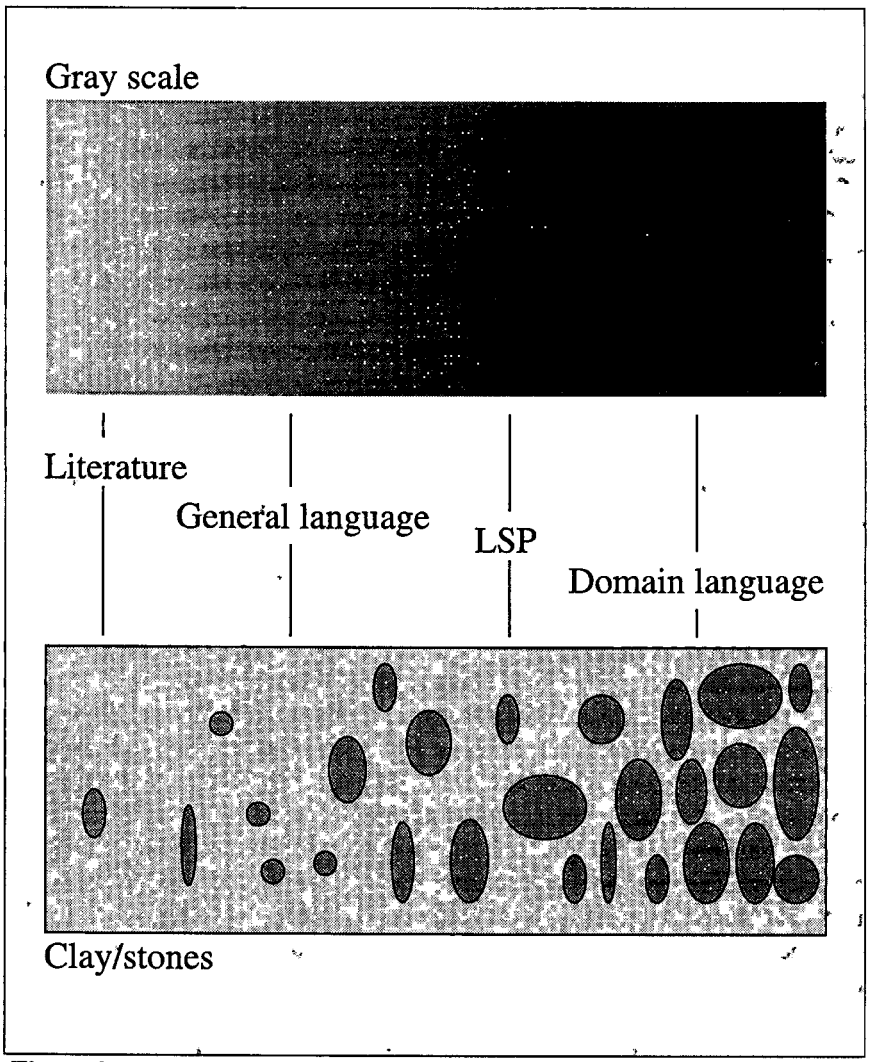

Figure 2: Different analogies for types of text

analogy, as proposed here, implies that techniques that apply to stones will never work for clay, and thus, texts that contain more and more clay with fewer and fewer stones will be more and more resistant to stone techniques. New techniques will have to be developed that take into account the different natures of clay and stones. It will turn out that part of that difference is based on two types of ambiguity.

3.6 Fundamental ambiguity versus superficial ambiguity

In this book we will distinguish between superficial and fundamental ambiguity. Both types of ambiguity include the traditional notion of multiple word-senses for the same string of characters. Terminological units (stones, according to the previous analogy) exhibit only *superficial ambiguity* because in a well-defined, narrow domain, a relatively stable, finite inventory of concepts are mapped to a given LTU, and in a given situation, the LTU means exactly one of those concepts (except for puns, a rarity in domain-specific text, where it means two simultaneously). Indeed, the normal and desired case for a terminological unit is for only one concept to be *mapped* onto it (that is, linked to it) so that there is a one-to-one correspondence between term and concept. On the other hand, when no stable, small inventory of concepts is associated with an LTU (that is, when dynamic, unpredictable meanings are created as needed in new situations thanks to the flexibility of the clay in the previous analogy), we will say the LTU exhibits *fundamental* ambiguity. Fundamental ambiguity involves three levels: (1) a superficial ambiguity between a given LTU and two or more concepts that map to it; (2) a second, deeper, dynamic ambiguity of *which* concepts and variations of concepts map to the LTU, and (3) a third, even deeper ambiguity between the world and the various concepts associated with an LTU such that no language-independent universal set of sememes exists. Fundamental ambiguity could also have been called *fluidity* (as suggested by John Hutchins) or *indeterminacy* (as suggested by Roy Harris). Clearly, arguments for or against fundamental ambiguity will involve basic philosophical issues.

This distinction between superficial and fundamental ambiguity is related to the issue of whether there is a stable comprehensive list of language-independent universal sememes. Within a narrow, well-organized domain, no fundamental ambiguity exists. The set of concepts is created and controlled by those who are influential in the domain. People decide what concepts belong to the domain and how they relate to the world. They use general language to

define the domain, including its concepts and terms, and they can keep it stable until they choose to modify it and re-stabilize it. From within a domain, one cannot see beyond the human-maintained wall that surrounds it, so all ambiguity appears to be superficial. General language is the **metalanguage** for domains. However, for general language I have claimed that there is no stable, comprehensive list of sememes to map onto, and if I am right, there *may* be fundamental ambiguity in general language. There may well be a language-independent set of mathematical principles that very accurately describe the physical properties of matter at subatomic, atomic, and molecular levels (though even physics has a kind of ambiguity in the probabilistic aspects of quantum mechanics), but this does not *necessarily* imply that all concepts of human language are built up mechanically from physical principles. If *some* concepts are not built up mechanically from universal principles, then where might they come from? If *all* concepts are built up mechanically from atomistic concepts, then can we have a changing set of concepts associated with an LTU without requiring fundamental ambiguity? These questions will be explored more seriously later on. For now, we will merely give an informal introduction to the issue of whether there is fundamental ambiguity in language.

In our work on machine translation in the 1970s, we were able to maintain, over a period of several years of intensive work, our belief in a comprehensive list of language-independent sememes underlying general languages. If this presumed list does not actually exist, then how were we able to maintain a belief in it? One reason is that for any specific sentence in any specific text, one can, in retrospect, define a sememe that maps to each word. The problem is that for many words, the list of all possible sememes mapped to a word cannot be established in advance. This does not imply that meaning is random; meaning is dynamic and always motivated (at least in hindsight). And this dynamic aspect of meaning is the basis for fundamental ambiguity. For example, take the word 'dust'. Dust can be a noun or a verb. As a verb, it can mean to take off dust, as in 'dust the furniture' or 'dust the plants in the living room'. But in the fields, 'dust the crops' might mean to put pesticidal dust *on* the plants. In a novel or in an editorial, an author might create a new meaning for dust, such as 'to reduce to dust'. Each new verb meaning of 'dust' will have a syntactic paraphrase and will likely include 'dust' as a noun, but that does not mean that a complete list of possible meanings of 'dust' can be established in advance. A syntactic approach may be able to account for each meaning that turns up, after the fact, but there is no predetermined list of potential meanings for 'dust'.

Recently, I saw a bottle marked *tamper evident*. For an instant, I tried to figure out what it meant based on the expression *tamper proof*, and I wondered whether it meant that someone had evidently tampered with the bottle. Then I realized that it meant that it should be evident to the user whether the bottle (in this case, a bottle of medicine) had been tampered with prior to purchase. Suddenly, a new meaning had been created for me. Some seemingly similar ambiguities can be handled with Generative Grammar, for example, the two readings of "electronic cat door": one in which the door is electronic, and the other in which the cat is electronic. The ambiguity in "tamper evident" is temporally based and is not easily handled structurally. Later, I saw another bottle which sported the phrase *body building*. Having worked as an instructor in a fitness center during high school, I immediately wondered what the bottle (in this case, a bottle of shampoo) had to do with weight lifting. Then I realized that it meant that the shampoo was claimed to increase the *body*, that is, the bulk, of ones hair. Not only is this a different sense of 'body', there is also a subtle shift in the meaning of 'build' in the two senses of 'body building'. Is there a finite, pre-determined list of possible nuances of meaning for 'build'?

Sometime later, I ran across a text by Pourtales (1966) that gives some background to Berlioz's writing of *La Symphonie fantastique*. Pourtales writes that Berlioz *buvait le temps comme les canards mâchent l'eau* (literally, "drank time like ducks chew water"). This introduces a new sense of drinking which is not likely to be in a dictionary.

Continuing with animals, we can imagine that an author could call an automobile a dog. In context, this could mean that it is unstable on slippery roads, essentially wagging its tail like a dog. Is there a limit to future metaphorical meanings of 'dog'?

All good literature is full of subtle new meanings created to give flavor to a particular text. And the further we go from concrete words like 'dog' toward abstract words like 'good', the harder it is to claim that a small list of well-defined concepts is associated with every word. If there is even one word for which there is no list of well-defined concepts, then there is something beyond superficial ambiguity.

Suppose there is a stable, finite set of atomistic building-block concepts from which all others are mechanically derived. Further suppose that some words do not have a well-defined list of senses but that as each new sense is dynamically created, it is a mechanical combination of the atomistic concepts. This state of affairs would certainly make machine translation challenging, but it would not fully qualify as allowing fundamental ambiguity, since all

meanings would be derived from one system of categorizing the world. In this case, all possible viewpoints (categorizations) would be derived from the same underlying set of concepts, and with sufficient knowledge, one would expect to be able to completely understand anyone else's viewpoint. On the other hand, if there *is* fundamental ambiguity in language, there can be mutually incompatible viewpoints that are all consistent with the same physical world but that cannot be brought together under one coherent framework. Here we are touching on the issue of the **grounding** of language, which will be further explored later on. Is language grounded on anything at all? If not, then how do we communicate? If so, then on what?

The rest of this chapter will *not* attempt to demonstrate conclusively that there is fundamental ambiguity in general language. Instead, the next sections simply argue from several directions that there is a significant difference between domain-specific language and general language. In the background is the argument that a convincing general/domain distinction would make it more plausible to suppose that general language exhibits fundamental ambiguity. Later sections suggest connections between mainstream linguistics and the general/domain distinction. Eventually, we will consider preliminary implications for machine translation. A look at George Lakoff's recent work will suggest that the general/domain distinction may be related to **objectivism**, which underlies many linguistic theories.

Objectivism is a philosophical stance which implies that there is no fundamental ambiguity, so in the next chapter we will look at various traditions in Western philosophy in search of one that will allow for fundamental ambiguity without destabilizing language completely; in other words, we will look for an explanation of language that allows for the possibility of language as we feel it to be intuitively—fresh and alive, not tied down to any one view of the world, yet not so free floating as to disallow meaningful human communication. We will conclude our philosophical search with an introduction to an approach based on the work of Emmanuel Levinas, which allows for fundamental ambiguity without claiming that meaning is random. I realize I have not proven and will not prove the existence of fundamental ambiguity (since acceptance or rejection of fundamental ambiguity is a starting point rather than a conclusion), but I hope to suggest that it is plausible and that it provides a basis for the distinction between general and domain-specific language, which in turn explains the current status of machine translation and predicts its future. The final chapter will further explore some implications of our view of the general/domain distinction for translation

theory and translator tools. With that preview, we now return to various arguments for the general/domain distinction.

3.7 Evidence for the general/domain distinction

To this point I have suggested that there is an important difference between general language and domain-specific language, or, otherwise put, between lexical units (words) and terminological units (terms). We have used the metaphor of a wall to describe the barrier (or zone of instability) that is built around the concepts and terms of a domain to distinguish the domain from general language. And I have claimed that most texts we encounter in real life consist of a mixture of lexical units and terminological units. So we will look at a few examples of text that will explain what I mean by the dynamic use of general vocabulary mixed with more static terms. Then we will look at two kinds of evidence for the importance of the general/domain distinction. The first kind of evidence will be words whose meaning (as evidenced by translations) is not reducible to a list of separate senses. If indeed such words exist, then they would be evidence that such LTUs differ significantly from domain-specific terms which display at most superficial ambiguity. The second kind of evidence will be facts from the history of computer processing of **natural language** that suggest that certain techniques apply only to domain-specific text.

3.7.1 Examples of dynamic versus static LTUs in LSP text

We will now consider a few examples of LSP (Language for Special Purposes) text and look for words, especially words that have dynamic meanings, to illustrate differences between the properties of words and terms.

LSP text is everywhere around us. In looking at a few pages of an old issue of *Byte* magazine,[10] I found the following examples of LSP text:

> The quality of IEF-developed systems is remarkable. In recent CASE research by the Gartner Group, application developers were asked to report the number of abends they had experienced.

The first sentence follows this pattern: The *x* of *y*-developed systems is *z*. Here *x* is 'quality' (a word of general vocabulary), *y* is 'IEF' (a term which