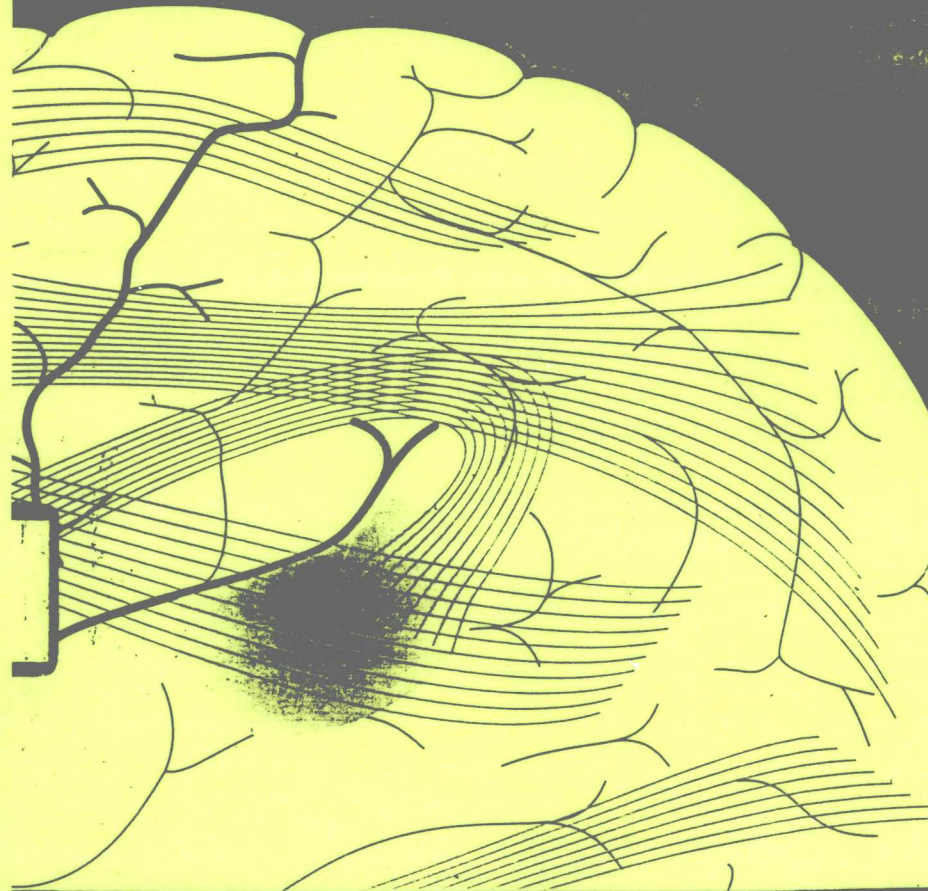


SYDNEY M. LAMB

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BASIS OF  
LANGUAGE

The Neurocognitive Basis of Language



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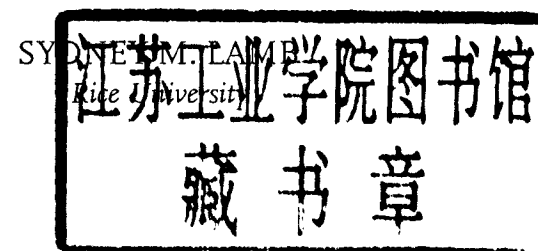
Volume 170

Sydney M. Lamb

*Pathways of the Brain*  
*The neurocognitive basis of language*

PATHWAYS  
OF THE BRAIN

THE NEUROCOGNITIVE  
BASIS OF LANGUAGE



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## Dedication

To friends I know and those I haven't met,  
my co-explorers of these hidden paths.

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## PREFACE

Until my senior year in college, I didn't even know that the field of linguistics existed. It was much smaller then, with courses available in only a handful of universities. I had often thought that there ought to be such a field and that I would want to take courses in it if it did exist, since I had found the study of foreign languages (Latin, German, Russian) interesting. But the only means available at my university for going on with language study after the elementary level was to study literature. Actually, Yale did have a program in linguistics, an illustrious one as I learned later, but it was only for graduate students. The reason I thought there ought to be such a field was that the investigation of language in itself — as opposed to the literature embodied in it — might make it possible to get a handle on how thinking works, on how our mental systems try to give us understanding of the world and our relationships to it. Our thinking systems are the means of all our science and of all philosophy.

Most of the linguistics of the past few decades has been concerned with topics other than those of this book. Language is so rich and variegated, and the languages of the world so diverse, that the available research topics cover a vast scope. In my graduate student days (at UC Berkeley), the study of the mental basis of language was actually forbidden territory. It was thought that there was no scientific or logically valid way to pursue such studies and that linguistics could not claim to be a science if it indulged in them. For me to accept that view would have been to dash my own hopes of understanding how language is related to the mind. Fortunately, I did not have to wait very long for a change of climate that allowed 'mentalist' studies to become respectable.

I still feel, as I did in my naive Freshman days, that a proper goal of a human being is to try to understand the world. But our attempts to understand the world are exercises of our minds, our instruments for knowing things, and are restrained and sometimes even led astray by limitations of these instruments. Our minds engage in thoughts, and thinking gets embedded in our words. We need to understand how language moves our thinking so that we can understand how much of what we think we know comes just from operations of our thinking instruments. If they are faulty, how can they reach understanding? If you see the world through tinted glass the world looks tinted. Is it really tinted or is this appearance just the contribution of the glass? It might have just the color

of the glasses and they only amplify; but if you aren't aware that you are wearing glasses you don't even ask such questions. Our predicament is worse not only since the mind is far more complex than some tinted glass, but also since we cannot take it off. And even when we try to understand the mind we have to use it still.

Because this book treats language and the brain, included in its subject matter are the languages and information systems of its readers. You the reader have a brain, which you too can examine indirectly to obtain some evidence pertaining to the observations of these pages. If you care to, you can take my words as not just findings I have reached but as a guide to your exploring of the structure of your own device for thought.

In this book, I use the pronoun 'I' to refer to myself, 'you' to refer to you the reader, and 'we' for you and me together. I tell you this because according to the convention followed in some books, the author refers to himself as 'we'. I'm not doing that — when I write 'we' I mean you and me together, for example as we take the next step in our joint exploration. I think of it as a joint exploration rather than as me leading you by the hand, for two reasons: First, you won't really get some of the points unless you let your mind actively participate in the process. I want you to think for yourself and not to take my word for anything; all I am doing is giving you some things to think about, in a somewhat ordered way. Second, it is not that I have completed the exploration and am now telling you what I have found. This exploration is in progress now for me while I am writing this account, and so I think of you as someone I can talk to as I find my way. And so you are exploring right along with me.

When I was young I had a wild dream: to understand the workings of the mind. There was no way I could foresee what things I might encounter nor how far I'd get. And now I have come farther than I dreamed I ever would, and so my heart is full of gratitude for all the help received; and yet the journey is still far from done. Though much more exploration lies ahead, my hope is strong because I am but one of the explorers of this hidden land. The others and young pilgrims yet to come will bring more light to make the darkness fade away as in the hour before the dawn.

## CHAPTER ONE

### THE WINDOW OF THE MIND

There are two problems with illusion in linguistics: the use of fictions when it is not necessary ... and the use of fictions by people who do not recognize that what they are doing constitutes a fiction.

William J. Sullivan

Some years ago I asked one of my daughters, as she sat at the piano, "When you hit that piano key with your finger, how does your mind tell your finger what to do?" She thought for a moment, her face brightening with the intellectual challenge, and said, "Well, my brain writes a little note and sends it down my arm to my hand, and then my hand reads the note and knows what to do." Not too bad for a five-year old. She was at that time learning how to play a very simple beginner's tune on the piano, one note at a time.

I think we can all agree right away that this theory has problems. Sarah too agreed as soon as I started asking her questions about it — like "Does your brain have little pieces of paper in there, and a little pencil? Does your hand have little eyes inside to read the note? How does the note travel down your arm?" Of course, in interpreting her statement we can give her the benefit of assuming that she was speaking metaphorically — just as contemporary cognitive scientists commonly do when theorizing about what our minds are doing to make our mouths produce speech. And, what may be a little surprising to you, their metaphors are often hardly more sophisticated than that of this five year old. They too might be excused on the grounds that they are speaking metaphorically — their descriptions can be taken as qualified by 'as if': It is *as if* the brain were writing a little message, and so forth — *as if* qualifying every such statement. But if we really want to understand how the brain works, the 'as if' mode of talking about it will not do; it excuses us from thinking the hard thoughts about what is really going on in there. It is, in short, a cop-out.

Do contemporary cognitive scientists really describe the operation of the brain in this way? The answer is: yes, many do — including highly respected ones. And not just cognitive scientists; it is also common practice even among neurologists, neuroscientists, and psychologists. This mode of theorizing is seen in their statements about such things as *lexical semantic retrieval*, and in descriptions of mental processes like that of naming what is in a picture, to the effect that the visual *information* is *transmitted* from the visual area to a language area where it gets *transformed* into a *phonological representation* so that a spoken description of the picture may be produced. Such phraseology can readily be found in current issues of such fine scientific journals as *Brain and Language* and *Journal of Cognitive Neuroscience*, and in widely used and highly respected handbooks of neuroscience. It is easy to find nothing wrong with such ways of talking about mental operations — you may be wondering why I am taking exception at all. If so, I ask you to look at these phrases once again and think about what they imply: information being represented as symbols, put in places from which they can be later retrieved, moved from one place to another. It is the theory of the five-year-old expressed in only slightly more sophisticated terms. This mode of talking about operations in the brain is obscuring just those operations we are most intent in understanding, the fundamental processes of the mind.

An alternative to this way of thinking about brain function, with its writing and reading and transmitting of symbols — we may call it the symbolic mode — has been around in one form or another for more than a hundred years. Commonly known as connectionism, it was proposed by a German neurologist named Carl Wernicke (1848-1905) way back in 1874, and was elaborated on by another German neurologist named Ludwig Lichtheim (1845-1928) in 1885. From at least the 1890s connectionism has been a controversial theory in neurology, and although it has had a considerable following among clinical neurologists throughout the ensuing period now amounting to well over a century, it has also been subjected to vigorous attacks. In part, the attacks arose from failure of the attackers to appreciate how connectionism really works; in part in reaction to excesses of some of the connectionists who got carried away by their enthusiasm for proposing elaborations of the theory without sufficient evidence; and some of them, too, failed to appreciate how connectionism really works.

After several decades in which the Wernicke-Lichtheim theory languished in disrepute because powerful critics had prevailed, it was revived and refined in the 1960s by the great neurologist Norman Geschwind (1926-1984), and many neurologists now recognize the 'Wernicke-Geschwind theory' as standard and as very useful in clinical work with stroke patients who have impaired language

skills, while others regard it as controversial and in need of refinement; and still others, mainly theoreticians not engaged in clinical work, consider it to be downright wrong. Recently there have been some especially strong and persuasive attacks against connectionism, and in particular against the Wernicke-Geschwind model, which have convinced many cognitive psychologists, perhaps the majority, that it is too drastically invalid to be taken seriously. We are going to look at these arguments and we will find that they are flawed.

Yet the alternative being used by these same theoreticians — the symbol-processing theory — can not really be taken very seriously either. If you are not convinced at this point I don't blame you, but perhaps you will be when you have read further. In its various formulations, the symbol-based theory looks more sophisticated than in the version articulated by the five-year-old, but it is essentially the same theory, let's face it, with the same weaknesses. Some might try to justify it on the grounds that that's the way computers work — and computers do indeed perform operations equivalent to writing and reading and transmitting symbols, not with little pencils and little eyes, but electronically. But the brain is not a computer, and everything we know about it and about the brain tells us that these two are vastly different in both structure and operation. We will be taking a look at some of these differences.

Actually there are different ways of interpreting the Wernicke-Geschwind theory, which is therefore not a theory but a family of theories. What they share, from the tradition which Wernicke started, is the idea that language processing is complex and requires the cooperative operation of several different processing centers — one for recognizing speech, another for producing speech, others for lexical and conceptual information, and so forth. As the multiple centers are involved together in most linguistic operations — for example, as we speak we are also listening to and monitoring our own speech; as we think we are performing processes of inner speaking and listening — it is a system which uses distributive processing and parallel processing. But within this conception we still have two distinct ways of answering the basic and vitally important question of just how information is represented within those various centers. My presentation so far is oversimplified in its implication that a connectionist theory avoids the use of internal symbols, with the concomitant problems of how to write, store, transmit, and read them. Actually, most of those who use a version of the Wernicke-Geschwind theory nevertheless suppose that within each of the various centers there are symbols which undergo various processes. This too is a version of the note-writing theory of my five-year-old daughter, as opposed to what we may call a 'pure connectionist' or 'radical connectionist' theory, which accounts for all processing of information by means of connections. How can

this work? How can we operate on linguistic information without any internal symbols? As you read on I hope the answer will become apparent.

A very different kind of connectionism that has emerged from cognitive psychology in recent years is often called 'parallel distributed processing', although that term could be applied equally appropriately to any connectionist theory, including some versions of the Wernicke-Geschwind theory. This newer connectionist theory agrees with the radical version of Wernicke-Geschwind connectionism in explicitly avoiding the use of symbols, having all its information in the connectivity of the network. But it contrasts markedly with the Wernicke-Geschwind version in two important ways: First, it looks at information processing more microscopically. Second, it is rather implausible from a neurological point of view; that is, it has properties that are widely out of accord with well-known properties of neurons and their interconnections. Despite this lack of plausibility it has, surprisingly, received favorable mention in some of those same handbooks of neuroscience mentioned above. On the other hand, many cognitive psychologists have criticized it vigorously, and for good reason; but in doing so they often give the impression that their arguments apply to connectionism in all its varieties rather than just to this one unrealistic variety with its various unrealistic properties.

What then are we to do, given two theories — rather, two families of theories, each with subtypes — both of which are untenable? The exploration of these pages leads to what I propose as a satisfactory answer. It stands upon and is compatible with a variety of kinds of evidence — mainly linguistic, but also psychological and neurological; and some of its features have already been foreshadowed in the thoughts of a leading neurologist, Antonio Damasio (1989a, 1989b, 1989c), and a leading neurobiologist, Gerald Edelman (1987). Although we will start from the beginning, which will look very different from the end result, we will end up with a revised version of the Wernicke-Geschwind model. Clearly, one of the things we have to do is consider the recent vigorous attacks against connectionism. We shall see that some of them are based on misunderstanding of connectionism — or at least, of what connectionism ought to be — while some of them, along with additional evidence, oblige us to refine the theory.

### *Investigating Language*

Our exploration starts with the idea that the basis of language is a mental system — in contemporary jargon, a cognitive system — not a hard principle for people to accept nowadays. Not so long ago the mind was considered off limits in linguistics and psychology, some ineffable thing that could not and should not be explored, since it is not observable, and the only acceptable way to do

linguistics was to analyze the things that people say or might say — the *outputs* of their linguistic systems. This kind of linguistics, the usual kind, may be called analytical linguistics.

But the mind *can* be observed indirectly, through what it produces and how it makes us react when it receives things from the world and from parts of our bodies. Nevertheless, the shyness of linguists about investigating the mind has been so *tenacious*, and the mind so elusive, that even today most linguists have changed their analytical methods hardly at all, even while professing an interest in the mind.

What is the linguistic system in the brain? Part of it has to be whatever it takes to activate the muscles which control the speech-producing mechanism in order to execute and coordinate the various movements which will cause them to make the sound waves that we call speech. In this exploration we need to ask about that and also about what is in the mind of the person who hears a series of words that enables that person to interpret what is being received by the ears.

Although linguistics has become much better-known in recent years than it was when I began studying it, I still find that most new acquaintances, upon learning that my profession is linguistics, are puzzled about what that could be. To the linguist such puzzlement is astonishing, as language is so full of amazing and mysterious complexities that its exploration continues to fascinate explorers decade after decade. In fact, so vast is the territory, much of it still uncharted, that there are several widely differing branches of linguistics, each with its own phenomena for study and methods of investigation. Some examples are:

- *Historical-Comparative Linguistics*: Comparing related languages, reconstructing features of their earlier forms, and discovering deep-seated relationships among diverse tongues.
- *Analytical Linguistics*: Analyzing, classifying, and describing properties of linguistic productions such as sentences; comes in several versions, including Structural Linguistics, Generative Grammar, Functional Grammar.
- *Computational Linguistics*: Computer simulation of linguistic processes.
- *Sociolinguistics*: The study of variation in speech forms in relation to social differences including gender.

In addition there are approaches to the study of grammar which are quite popular outside of the field of linguistics:

- *Traditional Grammar*: The old tradition going back to the ancient Greek and Latin grammarians, which has come down through the centuries in schools, still taught in many high school English classes and in foreign language textbooks.
- *Prescriptive Grammar*: Rules about the 'correct' way to say and write things, like the rule that you must not split infinitives or end a sentence with a

preposition. Some of these rules are based on arbitrary criteria and downright mistaken notions and are scoffed at or ignored by most linguists.

In most of these areas of linguistics, and particularly in analytical linguistics, the focus of study is linguistic productions, things people say or might say — some linguists like to use made-up sentences for analysis, while others prefer to rely on actual productions of ordinary people.

Figure 1-1 attempts to depict the distinction between the linguistic system and its productions, for which we will use the term *texts*. It includes also a couple of entities of a third kind, representing grammars — the kinds of things analytical linguists like to construct. The set of possible texts is of course infinite, but that fact does not mean that it is unlimited. The outline suggests a boundary, but all boundaries are suspect. For now it can be accepted just as a very rough approximation. The arrows are intended to depict the relationship between the texts and the linguistic system: It is capable of understanding and of producing any of them. Similarly, it ought to be the task of a grammar to have some comparable relationship to those texts. Each grammar specifies (or defines or generates or accounts for) a particular set of productions, depicted as enclosed in an ellipse. If a grammar could be successful in this respect, that set of productions would correspond to the set of possible productions of an actual person's linguistic system — depicted as enclosed in the solid wavy-lined figure. Since such success is a practical impossibility, the figure shows that the two ellipses differ from each other as well as from the wavy-lined figure representing the actual set of possibilities for our hypothetical speaker. Of course, we recognize that that set has no actual boundaries, since there are

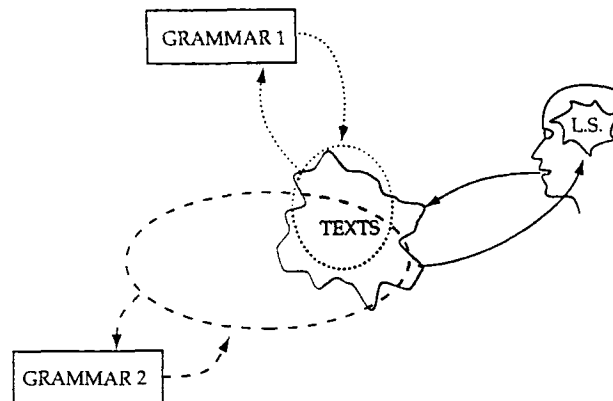


Figure 1-1. Linguistic system, texts, and grammars

borderline sentences and since the system can change from one moment to the next.

More about the two ellipses and the wavy-lined enclosure of the figure: No grammar reaching such a level of success that its set of texts would coincide with that of a real system has ever been written nor is such a grammar a practical possibility. Most grammars actually account for (or 'generate') a far larger set of texts than the actual set of a real linguistic system, since they fail to take account of the restrictions on combinations of sentences which are provided for by real linguistic systems. For example, a grammar which generates sentences but ignores combinations of sentences would by implication allow any sentence to be followed by any other sentence. But real human linguistic systems do not produce such gibberish, not even those of schizophrenics.

I must also emphasize that what the diagram depicts (with a wavy solid line) as a boundary around the set of texts for a person needs to be thought of as both fuzzy and changeable. This consideration must be accepted at the same time as that of the preceding paragraph.

Although the figure shows just two alternative grammars, there are actually not just two but *dozens* of ways to go about accounting for the potential productions of a typical speaker: dozens of different frameworks of description and principles of description, dozens of ways of subdividing the grammar into components, dozens of forms of rules, with their different modes of operation, etc.

### A Focus on People

In contrast to analytical linguistics, which puts its focus on linguistic productions, the areas I shall mention next put the focus on people, particularly on the brains of people. Here we may identify the three closely related areas known as/psycholinguistics, neurolinguistics, and neurocognitive linguistics. All of these share an interest in language in relation to the mind, but they have separate origins and each has developed a history of its own kinds of study. Psycholinguistics is mainly pursued by psychologists and it gets its information mainly from psychological experiments. Neurolinguistics has developed mainly out of medical work with patients whose brains have been damaged by stroke or injury or other causes, and has been concerned largely with correlations between type of linguistic impairment and location of damage. In recent years, brain imaging techniques like functional magnetic resonance imaging (fMRI), have begun to provide important additional information.

Neurocognitive linguistics used to be called just cognitive linguistics, but that simpler term is nowadays being taken over by people doing analytical linguistics — the word *cognitive* is so appealing nowadays. This field of study

uses mainly linguistic evidence but attempts also to integrate the findings from psycholinguistics and neurolinguistics. All three of these fields — psycholinguistics, neurolinguistics, and neurocognitive linguistics — are interested in the mental structures and processes underlying language, and there is an increasing amount of communication among their various practitioners. As they continue to converge, perhaps they will ultimately come to be regarded as one and the same field.

Why examine language if we are trying to understand how the brain works? Despite its great complexity, language is actually easier to figure out than various other systems of our minds. The system which makes vision possible, for example, is far more complex, thus much harder to get a handle on. This point has often been misunderstood by linguists who, understandably, have tended to overestimate the importance of language. The great American linguist Leonard Bloomfield (1887-1949), for example, asserted in his classic textbook that the learning of the native language, a task which every normal child accomplishes more or less successfully before entering first grade, is perhaps the greatest intellectual feat of the ordinary person's entire lifetime (Bloomfield 1933). But the more we learn about learning the more apparent it becomes that he was mistaken. Learning how to recognize objects and processes with the visual system is evidently far more complex. And in either case, it would be a mistake to suppose that the learning involved is like that which college students and scholars consider to be intellectual feats. For all their complexity, these mental subsystems are acquired by virtue of the almost automatic functioning of a vast network whose very nature is to acquire information (by building connections) as effortlessly as possible. The treatment of foreign language study in most schools and colleges, where it tends to be treated more as intellectual investigation than as absorption of information through automatic mental processes, usually misses this important fact.

What methods and evidence can be used for this kind of exploration? Although neuroscientists are learning more and more about the brain, they haven't been able to tell us how it performs the linguistic processes. Our methods must therefore be indirect. But that doesn't mean that they have to be fuzzy-headed or speculative. After all, the methods of nuclear physics are also indirect: Nobody has ever directly observed a subatomic particle.

#### *Four Kinds of Evidence*

Findings and beliefs about language, like findings in any field of knowledge, can come from evidence and analysis, or they can come from hearsay or from speculation. We naturally like to think that our beliefs about language are based on facts, upon observable realities, but many of them are based largely on

tradition. In linguistics there have been some basic assumptions that can be traced back through the academic generations all the way to ancient Greece, as Victor Yngve (1986) has shown. Illusions widely held by linguists and others include the beliefs that our minds contain words that we use when we speak, along with rules for combining them, that the words have meanings, and that words can undergo changes when they are spoken, such as the change of *f* in *knife* to *v* in *knives*. You may well react to my questioning of such beliefs with incredulity, even dismay. How could any sane person question such obvious truths? I only ask here that you suspend your dismay until you have read further. I mention these examples here to illustrate that illusions can seem to be very real. That they do provide demonstration of the power of our beliefs, in itself an interesting bit of evidence about how the brain works.

How can we separate myth from reality, fiction from fact? First, we have to be willing to question our myths about language, even our cherished ones. Second, we will want to consider evidence of all the relevant kinds, not just the kinds of data traditionally examined in linguistics. Much of the evidence is all around us, readily available for observation but nevertheless traditionally overlooked by investigators of language. Most linguistics examines only two of the four major kinds of relevant data. This limited view has left linguistics relatively isolated from other fields study, despite the fact that language is so richly intertwined with other areas of human experience and with the biological system which underlies it.

The four major categories of data relate to the four kinds of real-world phenomena that are relevant to language, the four landing pads where the linguistic helicopter has a chance to come down to earth from its flights — lest they remain flights of fantasy. We could call them *the four bases of linguistic reality*:

*First Base.* The organs and processes of speech production. Here we have no problem, as the well-developed field of articulatory phonetics provides excellent grounding.

*Second Base.* Linguistic productions of ordinary people: the things people say and write, which are also things that people can ordinarily comprehend. We can call them 'texts', and I will use the term 'text' to include either written or spoken discourse. The analysis of such material is the task of analytical linguistics, and that is most of current linguistics — which for the present is content to remain stuck on second base. Also, most current linguistics fails to consider various kinds of anomalous data which actually reveal very important information about the structure of the mental system which underlies our linguistic abilities, including slips of the tongue and unintentional puns.

*Third Base.* The processes of speaking and understanding, and related processes, including learning.

*Fourth base* (*Home plate* to baseball fans). The neurocognitive basis of language — the human brain.

A basic problem of analytical linguistics is that *there are indefinitely many different ways to analyze texts and to classify their components which can be justified by data of the second kind*. Each school of thought in analytical linguistics chooses to emphasize certain kinds of phenomena while neglecting other kinds. Therefore, choosing among them comes down to being persuaded to accept one set of proposals as opposed to another. Under these conditions the school of thought which prevails is the one which has the most skillful debaters, not the one whose formulations come closest to the truth. All could be about equally close to the truth as represented by the first two kinds of evidence. It is only by confronting the other two kinds that we can separate the sheep among them from the goats. For example, as Brian MacWhinney (1996) and others have pointed out, we have seen complex systems of phonological and syntactic rules, far too complex in their operation to be executed by a human brain in real time, also far too complex to be learned by the ordinary child. A grammar with no way of being put into cognitively realistic operation and no reasonable means of being learned is one which must remain forever unable to get to third base. The real linguistic systems in our minds *are* able to perform, and children *are* able to learn them.

In the present exploration we will be trying to figure out what the brain must have in it to allow it to produce and understand the discourse we can readily observe. It is surprising how far we can get by careful observation of these products of the mind — written and spoken texts — which are all around us. Careful analysis of such productions reveals a lot about the system which produces them. We also get a lot of useful information from texts which exhibit anomalies, including errors in thinking, and from cases in which a speaker's intended meaning differs sharply from the hearer's interpretation.

### *Nine Questions*

The mental system which makes it possible for a person to use language must include certain knowledge/information together with the ability to perform certain processes, including those of comprehension, speaking, and thinking. This system evidently also has the ability to operate upon itself, in acquiring new information and blocking or correcting old information found to be erroneous. These processes all together — comprehension, speaking, and thinking, together with acquisition, augmentation, and adjustment — may be called *LINGUISTIC*

*PROCESSES*. For each of these processes we may pose two questions: (1) How is it performed? (2) What structures must be present in the brain to make such performance possible?

I have mentioned that a person who can speak/understand (likewise read/write) a language does so by virtue of having certain information. We can ask several questions with respect to that information: (1) What does it consist of? What form is it in? How is it organized? (2) How is it used in comprehension? In speaking? In thinking? In learning? (3) How much of its organization is innate, and how much is learned? (4) How do language skills develop in childhood? How are they augmented and modified (in childhood and later)? (5) How does the linguistic system interact with other subsystems of the brain, such as the visual? (6) How does the cognitive system of one person interact with that of another through the use of language?

These questions overlap with other general questions that are especially puzzling: (7) What is meaning? (8) What is thinking? What are we doing when we are thinking? Can we think without words? (9) What is memory, and how does it work?

Our exploration, motivated by the search for answers to such questions, is largely an exercise in modeling, in which we try to figure out what the system must consist of to be able to produce the things we can readily observe coming from it, and to understand such things when they are received through the ears, or through the eyes in the case of written text; and what it must have that enables it to increase its competence by learning new words, new meanings for old words, and so forth.

This young field has been making erratic progress by a *method of successive approximations*. At each new step, errors of the preceding step are discovered and eliminated. But those errors were often there as a seemingly inevitable part of the exploration leading to that step. Whether this is the best way to operate or not, it is the way the field has operated, and it may be the best way for newcomers to learn; so that method will guide the order of presentation of topics in the following chapters. An inevitable feature of this approach is that certain findings of early stages, which help us to get to more advanced understanding, are nevertheless found to have been erroneous in some of their details. Thus we have started with the assumption — universally adopted by linguists in the past — that the elements of a linguistic structure, such as words and phonemes, are objects of some kind. After working with that assumption for a while we shall find that it is false; yet we will have made use of it in getting the exploration underway. Later we shall see that our first view of relational networks (explored in some early chapters) has some defects, which only get corrected in the later



pages of this work, after exploration that is made possible by this same network theory, faulty though it is.

### *The Transparency Illusion*

A serious problem in cognitive explorations, in both linguistics and psychology, is the elusiveness of the mind. Looking at the history of these fields, whose practitioners have often been drawn to them by their initial curiosity about the mind, one can get the impression that the mind takes an active role in obfuscating their explorations by deflecting them away from it and toward other phenomena, external phenomena. We can appreciate this problem through a distinction which is of the utmost importance to our exploration yet which is so little recognized that our language doesn't even have a term for it. Accordingly we may refer to it as 'The Distinction Which Has No Name'. As we have as yet no way of talking about it directly in our language, we can approach it in the terms of some related distinctions.

You may recall a time in early childhood when you wondered how all those little people got into the TV set. But if you look inside the TV set you don't find any little people. I don't remember this since I belong to an earlier generation — for me it was the radio. But I remember watching our little kitten Max the first time he noticed some people on the TV screen. He jumped up on top of the TV set and curved his neck around so that he could look into the back of the set — but since it was covered he was unable to see the little people. Similarly we shouldn't be misled by descriptions of analytical linguistics to suppose that we will find such things as little words and little syntactic rules and little sounds inside people's brains — no more than we will find little people there, even though we can of course visualize people.

This problem of having no way to talk directly about 'the distinction which has no name' exists because one of the functions of our minds is to make themselves as invisible as possible. They 'try', as it were, to make us think that they don't exist, that they represent reality directly. They 'want' us, as it were, to deal with reality directly, to ignore the fact that they intervene. The enormous amount of information processing that makes it possible for us to recognize objects presented to our sense organs is ordinarily outside our conscious awareness; we are aware only of the end results of all that complex perceptual processing. Thus an important aspect of the functioning of our minds is to make themselves as transparent as possible, keeping us from realizing that we are dealing directly only with them, our cognitive systems, and only indirectly, and through them, with reality. This is the *TRANSPARENCY ILLUSION*. A window or a pair of glasses functions best when it is as invisible as possible. The person who

wants to study windows must therefore make a special effort to look *at* the window rather than *through* it.

We can see the power of the transparency illusion in magazine articles and public television programs purportedly on the mind which are really devoted almost entirely to phenomena external to the mind, as if an article purporting to be on how television works turned out instead to be about how TV writers and directors and producers do their jobs in the TV studio, and what audiences do when watching TV programs in their living rooms or bedrooms while munching popcorn and operating their remote control devices; but with no mention of electronics. Similarly, many of the papers one hears nowadays at meetings purportedly on cognitive linguistics are analyses of data just like those of decades past, rather than attempts to tell us something about what the cognitive system is which makes human linguistic processing possible. Despite their 'cognitive' label, they are actually papers on analytical linguistics.

For most linguists the orientation of neurocognitive linguistics is still new and unfamiliar, even while the term 'cognitive' is being used with ever greater frequency. But that term has come to have two quite distinct meanings. Most linguists nowadays apply the term to their work if they are considering semantic or conceptual information. For them the term 'cognitive' is roughly synonymous with 'conceptual'. The idea behind this usage is that semantic and conceptual information is cognitive, by its nature, that semantics deals with 'mind stuff', while phonology, for example, is dealing with something else, sounds of speech. But in the other sense of 'cognitive', semantics is no more cognitive than phonology: Behind both the semantic and the phonological patterns observed by analytical linguists there have to be the mental systems that give rise to such patterns and which are able to recognize and to produce the information. For all levels of linguistic structure we have to recognize both the external and the internal aspect — the external is what analytical linguists study, the internal comprises the mental structures responsible for the external phenomena.

It is of course interesting to look at conceptual relationships. But just to treat them analytically is not enough to qualify such endeavors as cognitive in the second sense, that of the original definition of 'cognitive linguistics'. During the eighties, as the term 'cognitive' became a buzz word in the social sciences, linguists were more and more inclined to adopt this label as attractive for their analytical studies. By 1990 the majority of those using the term 'cognitive' in relation to their linguistic work were using it in the newer sense. And that's why we need the new term, 'neurocognitive', to replace 'cognitive' in its earlier use, for the kind of linguistics that pursues the internal aspect, the mental systems which are responsible for the patterns, and for processing the patterns, discovered in analytical linguistics. Neurocognitive linguistics, then, must treat not