

Introduction

If at this moment you look around you, wherever you may happen to be as you read these words, the odds are that most if not all of what you can see has been built, made, or grown by members of our own species. Even if you look out on wilderness, that wilderness survives only because it serves our pleasures, or because the task of subduing it outweighs the profit to be reaped from it—we could subdue it if we chose to. We tend to take such things for granted, and do not normally contrast our circumstances with those of the gorilla, the orangutan, or the chimpanzee. These creatures seem as remote from us as the jungles they inhabit. Not until we begin to think about it does it strike us as in any way remarkable that our world should be, not only utterly different from and far more complex than theirs, but also, in large part, our own creation. Other species adapt themselves to the natural world—we adapt the natural world to us.

Yet if you consider our respective natures, you would never expect the gap between us and the apes to be as vast as it is. We share with the chimpanzee perhaps as much as 99 percent of our genetic material, and our common ancestor may be as little as five million years behind us. Yet if apes look around them, what can they see that their own species has made? At most, the beds of broken boulders that they built last night, already abandoned, soon indistinguishable from the surrounding forest. The contrast is no less striking if we look at how much of the world each species controls. The chimpanzee has a few patches of jungle, while we have the whole globe, from poles to equator, and are already dreaming of new worlds. Most species are locked into their own niches, ringed by unbreachable barriers of climate, vegetation, terrain. We alone seem magically exempt from such bounds.

Nor does the gulf between us end with what can be seen. Each of us has a lively and persistent sense that we are able not only to act in the

world, but also to stand back, so to speak, and see ourselves acting; review our own actions and those of others, and deliberately weigh and judge them; seek in ourselves for the motives that inspire those actions; catalog our hopes, our fears, our dreams, and perform countless other operations that we subsume under the head of 'mental activities' or 'consciousness'. We do not know whether any other species has these particular capacities. We may well doubt it, for two good reasons.

First, many of us have lived at close quarters, on intimate terms, with other types of advanced mammal, yet no one has shown convincing evidence that any other species has a consciousness that resembles ours. It is true that failure to find something is no proof of its nonexistence. But the second reason lies in the likelihood that these two things—dominance over nature and a developed consciousness—are closely and indeed causally linked.

It is only because we can imagine things being different from the way they are that we are able to change them. But this imaginative capacity forms merely a part of our kind of consciousness. If that capacity were shared by any other creature, its fruits should surely be evident. Such a creature might be expected to share, even if only in a reduced measure, our own world-altering power. Since none does, we may take it, at least as a working hypothesis, that consciousness and power over nature are unique to our species, and that only through the first can the second come about.

These vast differences, qualitative as well as merely quantitative, between our species and those that are closest to it pose no problem for those who believe, as many still do, that we result from a unique act of creation, a supernatural irruption into the natural scheme of things. For those who do not believe this, and who find overwhelming the evidence that we developed, as all other species did, through the natural processes of evolution, these differences must remain puzzling indeed.

That evolution, over all-but-infinite time, could change one physical organ into another, a leg into a wing, a swim bladder into a lung, even a nerve net into a brain with billions of neurons, seems remarkable, indeed, but natural enough. That evolution, over a period of a few million years, should have turned physical matter into what has seemed to many, in the most literal sense of the term, to be some kind of metaphysical entity is altogether another matter. So, on the face of it, both sides seem to be left holding beliefs rather than theories: the one side, belief in a special creation, the other, belief in a no-less-miraculous transmutation of matter into mind.

Of course, things can't rest like that. The first side accepts miracles,

the second does not. Explanations must be sought, and have been sought, ever since Darwin wrote his *Descent of Man*. But somehow none of those explanations turns out to be really convincing. Each of them seems to slide away from the central problem into what are basically side issues: how the emotions developed, whether we are aggressive by nature, how much of our growth comes from culture and how much from biology, why our behavior should include altruism and incest avoidance. The real questions are, how did we get so much more powerful than anything else, and how at the same time did we get our peculiar kind of consciousness?

But, in confronting these questions, accounts of our species' development become embarrassingly vague. It was because of our big brains, some say. But if big brains were so adaptive, why had no previous species selected for them? Why only the hominid line? There have been a number of answers: because we used tools, because we made war, because we walked upright, because we were sexually competitive, because hunting on the savannas made our brains too hot. None of them, in and of itself, seems particularly compelling. Other species use tools, other species wage wars, other species hunt on the savannas, almost all species compete sexually; birds walk upright on two legs, and fly too.

An alternative possibility is that although none of these things alone was enough, their unique combination caused the brain to exceed some critical size, and it was the crossing of this Rubicon that radically altered our behavior. This proposal, like most 'bits-of-everything' proposals, sounds persuasive at first but proves less so on closer examination.

There are at least three things wrong with it. First, it lacks explanatory power. Was the particular set of factors that combined in early hominids the only set that could have created a species like ours, or were there—are there—perhaps others? If this question cannot be answered, it is simply because no one can yet explain how that set of factors worked to achieve its end. Second, it does not account for all the data. An expanded brain might give its owner greater powers to manipulate the environment, but why should it at the same time produce that characteristic doubleness of vision—'Here's me doing X, and here's me watching myself do X'—that consciousness gives?

In their book *Promethean Fire*, Charles Lumsden and Edward Wilson try to explain such a result with a graphic image: that of a mountain which, though only slightly higher than its grassy neighbors, becomes different from them by acquiring a cap of snow and ice. But this image, though vivid, does not really help. We know why the bigger mountain gets snow and ice on it; we don't know why the bigger brain gets consciousness in it.

The third thing wrong, one that affects all big-brain arguments, is that there is no evidence that brain size per se does anything for any species: Neanderthals had brains bigger than ours, and where are they now? Of course it is true that the larger a species's brain is, the more we would apply to it the convenient but ultimately vague and unhelpful label 'intelligence'. But that 'intelligence' (which is simply the capacity to perform varied and complex behaviors and to respond flexibly and efficiently to environmental input) is not a direct function of brain size, but rather of the number of sets of task-specific modules a creature has—modules each of which is devoted to some particular behavior or response—and the patterns of connections between those sets. In other words, it is the way in which the brain is organized, rather than its mere bulk, that leads to 'increased intelligence'. Of course the more task-specific modules a brain has, the bigger it will be, but size itself is a dependent variable.

This means that if the hominid brain got bigger, it did not do so by simply adding more 'spare' neurons. Indeed, it is questionable whether there is or ever can be such a thing as a 'spare' neuron (that is, a neuron that is not, initially at least, committed to any specific function). Rather, the brain got bigger by adding neurons that performed specific tasks. But what tasks? Having come full circle, we are back where we started—the additional neurons must somehow perform just those tasks of changing nature and generating consciousness that formed the original data to be explained. A century and a quarter after Darwin expounded the mechanisms of physical evolution, the mechanisms of mental evolution are still without a history and without a convincing explanation.

And yet the true source of our difference has been lying all the while, like Poe's purloined letter, hidden in plain view. There are not merely two things, consciousness and power over nature, that distinguish us from other species, there is a third thing: language. While it would be absurd to suppose that language in and of itself provided everything that differentiates us from the apes, language was not only the force that launched us beyond the limits of other species but the necessary (and perhaps even sufficient) prerequisite of both our consciousness and our unique capacities.

If this is so, why have people looked elsewhere for explanations? All along there have been those who recognized that language must have played an important role. Consider for instance the quotation from Darwin that serves as the epigraph for this book. But the precise nature of that role remained obscure because a number of factors conspired to make language itself an elusive and slippery object.

✱ Language is, of all our mental capacities, the deepest below the threshold of our awareness. The least accessible to the rationalizing mind. We can hardly recall a time when we were without it, still less how we came by it. When we could first frame a thought, it was there. It is like a sheet of transparent glass through which every conceivable object in the world seems clearly visible to us. We find it hard to believe that if the sheet were removed, those objects and that world would no longer exist in the way that we have come to know them.

That, in turn, is because for most of us language seems primarily, or even exclusively, to be a means of communication. But it is not even primarily a means of communication. Rather it is a system of representation, a means for sorting and manipulating the plethora of information that deluges us throughout our waking life. How such a system came to be, how it functions, and what it accomplishes will form the themes of this book.

Another factor that has made the role of language hard to evaluate is that until relatively recently linguistics, the study of language, was very little developed. Most of what we know about language has been learned in the last three decades. Very little of that knowledge is readily available to the general public. Physics, chemistry, biology are routinely taught in high schools, but through some accident of educational history, linguistics is hardly taught at all outside graduate school.

Yet merely to know linguistics is far from enough. With few exceptions, linguists have refrained from any consideration of the origins of language or the role that it has played in the development of our species. Noam Chomsky, arguably the Newton of our field, has dismissed the origin of language as an issue of no more scientific interest than the origin of the heart. Strategically, this made sound policy. We would never have learned as much as we have about the purely formal, structural properties of language if some scholars had not concentrated on these to the exclusion of all else. But if we do not transcend this strategy we can never hope to learn what we are, and why we are what we are.

The alternative course, pursued here, is by its nature a risky one. It entails crossing disciplinary boundaries and trespassing on fields so various that no single scholar could hope to encompass them all. It is therefore inevitable that anyone who attempts such a course may, here and there, quite unintentionally oversimplify or distort the findings of others. The most one can do is to try to keep such errors to a minimum. In any case, the risks seem well worth taking. A book can not and should not even hope to constitute some marble mausoleum, enshrining the final word on the topics that it broaches. A book is a machine to think with.

This book is a machine for thinking about language and what language has done for our species and how it has made us different from other species. If it helps us to think about these things in new ways, it will have achieved its aim.

The organization of the book is as follows. The first three chapters concern themselves with the nature of language. Chapter 1 contrasts language with animal communication systems and outlines its representational function, while chapters 2 and 3 try to show how that function works, looking first at words, how they convey meaning, and what kinds of meaning they convey, and then at the principles that organize words into sentences.

The next four chapters examine the evolutionary history of language. Chapter 4 traces, from their earliest beginnings, the developments in neurological systems that formed the necessary prerequisites for a species to acquire any kind of language. Chapter 5 examines some existing behaviors (of our species and other species) sometimes described as 'language', but perhaps better regarded as something intermediate between a prelinguistic state and true language. Chapter 6 shows how such a 'protolanguage' could have come into existence under the pressure of circumstances peculiar to our ancestors of two to four million years ago, while chapter 7 suggests ways in which systematically structured language could have developed out of an unstructured protolanguage.

The last two chapters look at some of the consequences for a species that possesses language. Chapter 8 concentrates on our species' inner world, from individual consciousness of self to the construction of complex knowledge-systems; chapter 9 turns to the outer world of our relations with one another and with the universe we inhabit.

As this book is aimed at a broad general audience, it was felt that footnotes and textual references would only distract the reader and disrupt the flow of the argument. Accordingly, notes on the text are given at the end of the book in the form of a commentary on each chapter, including references to works listed in the reference section.



The Continuity Paradox

Anyone who sets out to describe the role played by language in the development of our species is at once confronted by an apparent paradox, the Paradox of Continuity. If such a person accepts the theory of evolution, that person must accept also that language is no more than an evolutionary adaptation—one of an unusual kind, perhaps, yet formed by the same processes that have formed countless other adaptations. If that is the case, then language cannot be as novel as it seems, for evolutionary adaptations do not emerge out of the blue.

There are two ways in which evolution can produce novel elements: by the recombination of existing genes in the course of normal breeding, or by mutations that affect genes directly. Even in the second case, absolute novelities are impossible. What happens in mutation is that the instructions for producing part of a particular type of creature are altered. Instructions for producing a new part cannot simply be added to the old recipe. There must already exist specific instructions that are capable of being altered, to a greater or lesser extent. What this means is that language cannot be wholly without antecedents of some kind.

But what kind of antecedents could language have? Since language is so widely regarded as a means of communication, the answer seems obvious: earlier systems of animal communication. It has long been known that many species communicate with one another. Some, like fireflies, have blinking lights, others, like crickets, rub legs or wingcases together, while many exude chemical signals known as pheromones. Of course such means are limited in their range of potential meaning and may signal nothing more complex than the presence of a potential mate. But the more sophisticated the creature, the more sophisticated the

means—from the dances of honeybees, through the posturing of sea gulls, to the sonar of dolphins—hence, the more complex the information that can be conveyed. Could not human language be just a supersophisticated variant of these?

The trouble is that the differences between language and the most sophisticated systems of animal communication that we are so far aware of are qualitative rather than quantitative. All such systems have a fixed and finite number of topics on which information can be exchanged, whereas in language the list is open-ended, indeed infinite. All such systems have a finite and indeed strictly limited number of ways in which message components can be combined, if they can be combined at all. In language the possibilities of combination, while governed by strict principles, are (potentially at least) infinite, limited for practical purposes only by the finiteness of the immediate memory store. You do not get from a finite number to infinity merely by adding numbers. And there are subtler but equally far-reaching differences between language and animal communication that make it impossible to regard the one as antecedent to the other.

But the net result of all this is the Paradox of Continuity: language must have evolved out of some prior system, and yet there does not seem to be any such system out of which it could have evolved. Until now, arguments about the nature, origin, and function of language have remained inextricably mired in this paradox. Let us see if there is any way in which they can be released from it.

A WORD ABOUT FORMALISM

We can at least clean a little of the mud from our wheels if we begin by tackling what might seem at first an unpromising and unrelated issue: the role that formal structure plays in language. Some linguists will tell you that the formal structure of language is very important. Others will tell you that it is relatively unimportant. Who is right?

There are two very odd imbalances between the formalist and antiformalist groups. The first imbalance is in what they believe. No formalist believes that a purely formal approach is the only way to study language. Any formalist would agree that there are many aspects of language—meaning, use, interaction with other social and psychological domains—that are all worthy of study. If you ask formalists why they insist on studying formal structure in isolation from all these other factors, they will probably tell you that significant advances in knowledge have always

involved focusing on particular aspects of things and abstracting away from other aspects. They can see no reason for the study of our own species to reverse this sensible procedure.

But if you ask antiformalists why they ignore the formal structure of language, you will sometimes hear a much less tolerant story. They may tell you that it is quite senseless to study the formal aspects of language in isolation from its mode of functioning in society. Quite possibly they will go on to say that since those aspects are merely uninteresting mechanisms, or superficial trimmings, or even artefacts of the method of inquiry, they can be relegated to an inferior position, if not dismissed altogether.

The second imbalance between formalists and antiformalists is that since formalists have ignored all issues involving the evolution of language, that field has been yielded without a blow to the enemies of formalism. Subsequently there has been no significant interchange between the two sides, indeed they are barely on speaking terms. This has left the antiformalists alone to grapple with the Continuity Paradox.

Now to tackle a paradox, or indeed any research issue, from a one-sided position is not the best recipe for success. In large part, failure to resolve the Continuity Paradox has resulted precisely from what one might call the 'naive continuum' of the antiformalists, who have tried in a variety of ways to establish a direct line of development from animal communication to human language. Although all their efforts have significantly failed to produce a convincing 'origins' story, their rejection of more formal approaches has left them without any viable alternative.

Accordingly the present work tackles the Paradox from a rather different viewpoint. This viewpoint takes as basic the assumption that formal properties of language do exist and do matter, and that without the very specific types of formal structure that language exhibits, it could not perform the social and communicative functions that it does perform, and could not convey the wealth of peculiarly human meaning that it does convey.

Those functions and that meaning should not—and, indeed, in a work of this nature literally can not—be ignored or even minimized. However, it seems reasonable to stand the antiformalist position on its head and say that it is quite senseless to study the origins and functions of language without at the same time studying the formal structures that underlie those functions. For these formal structures, abstract though they may appear, are exactly what enable language to communicate so efficiently. Nothing else that we know of (or can imagine) could have given language

the unprecedented power that it proved to have: power that gave to a single primate line the mastery of the physical world and the first, and perhaps only, entry into the world of consciousness.

THE GULF BETWEEN LANGUAGE AND ANIMAL COMMUNICATION

Having established this perspective, we can now look a little more closely at the ways in which animal communication differs from language. Perhaps the most obvious is that of productivity. The calls or signs of other creatures usually occur in isolation from one another. There are as yet few, if any, clear cases where they can be combined to form longer utterances whose meaning differs from the sum of their meanings in isolation, in the way in which *look out!*, for instance, differs from the sum of the meanings of *look* and *out*.

It is not impossible that future research will uncover such cases. But then, if we were to parallel language, we would have to look for cases where the same calls in a different order can mean different things, like *Dog bites man* versus *Man bites dog*. Even this far from exhausts the possibilities of human syntax, which can also place similar words in different orders to mean the same thing (*John gave Mary the book*, *Mary was given the book by John*) or the same words in almost the same order to mean quite different things (*The woman that saw the man kicked the dog*, *The woman saw the man that kicked the dog*).

Note however that to achieve such effects we have to use elements like *-en*, *by*, *that*. Later on we shall look at such elements in more detail. For the moment it is sufficient to note that they differ from elements like *John* or *woman* in that the latter refer (if only indirectly) to some entity or class of entities in the real world, whereas the former do not really refer at all, but rather serve to express structural relations between items that do refer. The first class of elements can be described as *grammatical items* and the second, the class that refers, as *lexical items*. To which class of items do animal calls and signs belong?

Certainly there seems to be nothing in any animal communication system that corresponds even vaguely to grammatical items. But it is also questionable, in at least a large majority of cases, whether there is any true correspondence with lexical items either. We may find, for example, a particular facial expression, accompanied perhaps by a bristling of hair, that we might want to translate as *I am very angry with you*, or a peculiar cry that perhaps we would translate as, *Look out, folks, something dangerous is coming!* In other words, most elements in animal communication systems might seem to correspond, in a very rough and

ready sense, with complete human utterances, rather than with single words per se. But note that the true correspondence is with utterance rather than sentence, because often times a single-word utterance like *Help!* or *Danger!* would serve as well. The category *complete utterance*, however, is not a structural category in language, precisely because it can cover anything from a complex sentence (or even a series of such sentences) to a one-word exclamation.

It follows that, for the most part, the units in animal communication systems do not correspond with any of the units that compose human language. There is a good reason why this is so. Animal communication is *holistic*, that is to say it is concerned with communicating *whole situations*. Language, on the other hand, talks mainly about *entities* (whether other creatures, objects, or ideas) and *things predicated of entities* (whether actions, events, states, or processes).

The units of animal communication convey whole chunks of information (rough equivalents of *I am angry*, *You may mate with me*, *A predator just appeared*). Language breaks up those chunks in a way that, to the best of our knowledge, no animal communication system has ever done. In order to convey our anger, we must, as an absolute minimum, specify ourselves by a particular sign and the state in which we find ourselves by another sign (in English and numerous other languages we have, in addition, to use an almost meaningless verb in order to link ourselves with our current state, while in another set of languages, we would have to add a particle to indicate that our state was indeed current, not a past or future one).

If we think about it, this way of doing things may seem somewhat less natural than the animal way. Suppose that the situation we want to convey is one in which we have just seen a predator approaching. From a functional point of view, it might seem a lot quicker to let out a single call with that meaning, rather than *Look out! A lion's coming!* But the oddity is not just functional. In the real situation, it is simply not the case that we would see two things: an entity (the lion) and something predicated of that entity ('coming'). If we actually were in that situation, what we would perceive would be the frontal presentation of a lion getting rapidly larger. That is, we would experience a single intact cluster of ongoing perceptions. So the animal's representation of this would seem to be not merely more expeditious, but more in accord with reality than ours.

But there are, even in this limited example, compensating features. A generalized predator warning call, or even a specific lion warning call, could not be modified so as to become *A lion was coming* (as in the con-

text of a story), *A lion may come* (to propose caution in advance), *No lions are coming* (to convey reassurance), *Many lions are coming!* (to prompt still more vigorous evasive measures), and so on. To achieve this kind of flexibility, any utterance has to be composed of a number of different units each of which may be modified or replaced so as to transmit a wide range of different messages. And after all, if we want a rapid response, the possession of language in no way inhibits use of the human call system. In a tight corner, we can still just yell.

Still, you might argue, language had to begin somewhere, and where is it most likely to have begun than in some particular call whose meaning was progressively narrowed until it now covers about the same semantic range as does some noun in a language? Once the species had acquired a short list of entities—lions, snakes, or whatever—it needed only to attribute states or actions to those entities and it would then already have the essential subject-predicate core of language, to which all other properties could subsequently have been added.

You might then point to creatures such as the vervet monkey which have highly developed alarm calls. The vervet, a species that lives in East Africa, has at least three distinct alarm calls that might seem to refer to three species that are likely to prey upon vervets: pythons, martial eagles, and leopards. That it is the calls themselves that have this reference, and not any other behavioral or environmental feature, has been experimentally established by playing recordings of the calls to troops of vervets in the absence of any of the predators concerned. On hearing these recordings, most vervets within earshot respond just as they would to a natural, predator-stimulated call. They look at the ground around them on hearing the snake warning, run up trees on hearing the leopard warning, and descend from trees to hide among bushes on hearing the eagle warning.

We might therefore think that these calls were, in embryo at least, the vervet 'words' for the species concerned. But in fact, a warning call about pythons differs from a word like *python* in a variety of ways. Even though *python* is only a single word, it can be modified, just as we saw the sentence *A lion's coming!* could be modified. It can, for instance, be given at least four different intonations, each of which has a distinct meaning. With a rising intonation it can mean 'Is that a python there?' or 'Did you just say python?'. With a neutral intonation, it merely names a particular variety of snake, as in a list of snake species, for example. With a sustained high-pitch intonation it can mean that there's a python right there, right now. With an intonation that starts high and ends low,

especially if delivered in a sneering, sarcastic tone, it can mean 'How ridiculous to suppose that there's a python there!'

Assuming that all these are used without intent to deceive, only in the third case is there a python there for sure. But with the vervet call, there is always a python there. At least, with one rare exception, the vervet involved genuinely believes there is a python there. (Just like human children, young vervets have to learn the semantic range of their calls, and again like children they tend to overgeneralize and sometimes give calls in inappropriate circumstances).

In order to understand further differences between humans and vervets, certain aspects of meaning must first be clarified. We might suppose that any relation between events in the world and meaningful utterances could be characterized as a mapping relation, that is to say, an operation that matches features of the environment with features of a (more or less arbitrary) representational system. We might begin by saying that a python in the real world is matched with a particular call in the vervet system and a particular noun in a given human language. This would be not very far from Bertrand Russell's theory of meaning and reference, for Russell believed, and got into terrible difficulties through believing, that nouns referred directly to entities in the real world.

Linguists, at least since Russell's contemporary de Saussure, have known that this is not so for human language. As noted above, grammatical items do not refer at all, and lexical items refer to real-world entities only indirectly. This is because not one, but at least two mapping operations lie between the real world and language. First our sense perceptions of the world are mapped onto a conceptual representation, and then this conceptual representation is mapped onto a linguistic representation.

Indeed, even in the animal case there cannot be a direct relationship between external object and call. Every now and then, even adult vervets will use, say, an eagle call for something that is not an eagle. It is no help to say that the vervet merely made a mistake. Why did it make that mistake? Because it thought that what it saw really was an eagle. In other words, if the vervet is wrong, it is wrong because it is responding to its own act of identification, rather than to the object itself. But are we then to say that the vervet responds to its own identification when it happens to be wrong and to the real object when it happens to be right? Obviously not. Vervets respond to their own identifications under all circumstances. But in that case there cannot be a direct link between call and object. The call labels an act of identification: the placing of some phe-

nomenon in a particular category. In some sense, vervets too must have concepts.

That the things words refer to are not external entities is even clearer in our own case. One piece of evidence is the very existence of expressions like *a unicorn* or *the golden mountain* that gave Russell so much trouble. Since such expressions cannot refer to real-world entities, they must refer to a level of representation that is to some extent independent of the real world.

Indeed, it is sometimes inescapable that linguistic expressions are referring not to real-world entities but to our conceptions of these. It is surprising that Russell never discussed sentences like *The Bill Bailey I love and respect is very different from the drunken monster you depict him as being*. Here, obviously, two concepts of the same person are in conflict. Nor can we escape the situation by pointing to the indisputable fact that one does not normally preface proper names with the definite article, and claim therefore that while *the Bill Bailey I love and respect* may refer to a concept of Bill Bailey, *Bill Bailey* alone can only refer to Bill Bailey the real-world individual.

Suppose I say *Bill Bailey is honest* and you say *Bill Bailey is a rascal*. Since both qualities cannot be simultaneously predicated of the same person, the referent for the first use can only be my concept of Bill Bailey while that for the second can only be yours. But what about *Bill Bailey left early*? If we say that the name here refers to a real-world entity, we are in the uncomfortable position of claiming that names sometimes refer to real entities and sometimes to concepts. It seems safer to say that they refer to concepts all the time.

Yet even though both calls and words refer indirectly, there is evidence that they do not do so in the same way. For instance, it's a safe bet that no animal system has calls for unicorns or golden mountains or anything else of which there is no sensory evidence.

Another way in which calls and words differ is that words can be, and usually are, used in the physical absence of the objects they refer to, whereas calls hardly ever are so used. There is one exception: numerous observers have reported, for vervets and other primate species, what look like deliberate uses of alarm calls in the absence of any predator, designed to distract other monkeys from aggressive intentions or to remove potential competitors for some item of food.

If these can be proven to be genuine cases of deception, would they serve to undermine the distinction between words and calls? The answer is no, for two reasons. First, the strategy would not work unless all the

other vervets believed, and behaved as if, there was a predator there. That is, it would work only if the deceiving monkey could rely on other monkeys to respond in the appropriate fashion. Second, in such observed instances the deceiving monkey itself failed to respond appropriately to its own call, even when it was in plain view of other monkeys. This suggests that the animal is not truly 'using a call in the absence of its referent' but simply exploiting one consequence of alarm calls (the disappearance of other animals from the vicinity) for its own personal ends.

Closely linked to these issues is the question of evolutionary utility. If human words were no more than the equivalents of animal calls, referring in the same way that animal calls referred, it would be remarkable that we have all the words we do. Vervets can 'name' pythons, leopards, and martial eagles. They cannot 'name' vultures, elephants, antelopes, and a variety of other creatures that do not have a significant impact on the lives of vervets. Why, in that case, is the human insect repertoire not limited to *fly*, *mosquito*, *locust*, and *cockroach* (plus any other insects that may significantly affect the lives of humans), and why is it that we have words—like *cockchaffer*, *ladybird*, *earwig*, and *dung beetle*—for countless species that affect us minimally, if at all?

Here we differ from other creatures along a rather interesting dimension. All other creatures can communicate only about things that have evolutionary significance for them, but human beings can communicate about *anything*. In other words, what is adaptive for other species is a *particular set* of highly specific referential capacities. What is adaptive for our species is the *system* of reference *as a whole*, the fact that *any* manifestation of the physical world can (potentially at least) be matched with some form of expression. The fact that this difference is qualitative rather than quantitative (vervets could increase their repertoire by many orders of magnitude without even approximating the global scope of human reference) suggests again that quite different mechanisms are involved.

We should take account, too, of the fact that while animal calls and signs are structurally holistic, the units of human language are componential in nature. What this means is that animal calls and signs cannot be broken down into component parts, as language can. Words are, on one level, simply combinations of sounds. These sounds are finite and, indeed, small in number, not exceeding seventy or so in any known language.

Though in themselves the sounds of a language are meaningless, they

can be recombined in different ways to yield thousands of words, each distinct in meaning. A word like *put*, for example, can be broken down into three distinct sounds: /p/, /a/, and /t/. Those same sounds can be recombined to form *top* and *apt*, two words of entirely different meaning. In just the same way, a finite stock of words (usually some tens of thousands, probably not much more than half a million even in the most 'developed' language) can be combined to produce an infinite number of sentences. Nothing remotely like this is found in animal communication.

To those already convinced that human language and animal communication are wholly unconnected, the foregoing paragraphs may seem like overkill. Yet contrasting animal communication and language has a purpose beyond merely convincing continuists that naive continuumism won't work. It has the purpose of clarifying exactly what it is that makes language look like an evolutionary novelty. For if we don't do at least this, our prospects of explaining the evolutionary origins of language are dim. After all, anticontinuists have failed even more dismally than continuists at providing a convincing history of language and mind. Until we cease to regard language as primarily communicative and begin to treat it as primarily representational, we cannot hope to escape from the Continuity Paradox.

THE NATURE OF REPRESENTATION

It may be advisable to begin by clarifying some aspects of the general nature of representations. What do we mean when we say that *X* represents *Y*? Normally that *Y*, an event or an entity in the real world, bears some kind of correspondence relation to *X*, such that *X* somehow recalls or expresses *Y*, but not necessarily vice versa. This definition is informal and crude, and there may be several things about it that are questionable, but it will do as a starting point.

The first point to note is that in fact everything that we or any other creatures perceive is a representation, and not in any sense naked reality itself. That is to say, no creature apprehends its environment except by means of sensory mechanisms whose mode of functioning is everywhere the same. Particular facets of the environment excite responses (in terms of variations from their unstimulated firing rate) from particular cells that are specialized to respond to just those facets and no others. These neural responses in themselves constitute a level of representation. The firing of such-and-such a collection of neurons at such-and-such frequencies corresponds to the presence, in the immediate environment, of

such-and-such a set of features. Almost simultaneously, in all vertebrates and many invertebrates, the original responses are synthesized and their synthesis, if functionally relevant to the creature concerned, is assigned to its appropriate category. This can be regarded as a further level of representation, in which the category assignment corresponds to a particular set of neuronal responses.

We do not, for example, directly see our surroundings. What happens is that sets of cells in our retinas programmed to react to specific features of the environment (lines at various angles, motions of varying kinds, different qualities of light, and so on) respond to those features on an individual basis, and this information is then relayed electrochemically to the visual areas of the cortex, where it is automatically reconstituted to provide a fairly, but not always completely, accurate simulacrum of what there is around us.

If this were not so, if our visual system merely presented us with a direct image of reality in the way that a mirror reflects whatever is before it, there would be no optical illusions. Optical illusions arise when properties of the visual system are imposed on the raw data of the physical world. Nor can we dismiss such illusions as marginal phenomena. When we look around us we see an entirely colored world, but color is simply a property of the perceiving mechanism. All of us have seen mountains, gray or brown in the light of midday, turn to blue as the sun descends, then perhaps to pink or crimson as the last rays touch them, then finally to black as night falls. Of course the mountains have not really changed color, only the light reflected by them has changed, and these changes in turn interact with our means of perceiving and categorizing differences in wavelengths. But in that case, what are the mountains' *real* colors? Clearly they cannot have any.

We can now return to an earlier remark that may have seemed problematic at the time. In the previous section, it was stated that expressions such as *the golden mountain* must refer not to the real world but to 'a level of representation that is to some extent independent of the real world'. How can we, one might ask, have a level that represents the real world but contains entities that do not exist in that world? If we treat 'representation' as meaning simply 're-presentation'—a wholly faithful one-to-one mapping from one medium to another—this seems absurd. But in fact, representation can never have such a meaning.

Consider the most basic facts about what a representation is and does. Although what follows applies to representations generally, let us, for the sake of concreteness, take as a particular example a painting of the

Battle of Lepanto; and let us for ease of exposition ignore for the present any intervening layer(s) of representation (sensory, conceptual, or other) that may come between the actual Battle of Lepanto and the painting with that title. It should immediately be clear that there are many properties of the Battle of Lepanto that the painting cannot represent. It cannot enable us, for instance, to smell the gunpowder smoke, or the sea spray, or the stench of blood below decks. The time that passed for an observer of the battle was determined by the length of the battle, but the time that passes for an observer of the picture is determined only by the observer's will. And there are many more properties of the actual Battle of Lepanto that are not, and indeed cannot be, represented in 'The Battle of Lepanto'.

But the converse is equally the case: there are many properties of the painting that never belonged to its original. 'The Battle of Lepanto', unlike the Battle of Lepanto, is made of paint and canvas, hangs on a wall, can be bought and sold, has properties of proportion that can be discussed by art critics, and so on. Yet even though 'The Battle of Lepanto' lacks much that the Battle of Lepanto possessed, and possesses much that the Battle of Lepanto lacked, we do not balk or express our derision when we read its title, instead we are perfectly prepared to accept it as a representation. Indeed someone who was actually present at the battle might have realized what the painting was meant to represent even without its title, by virtue of those features (names, types, and positions of ships, flags displayed, actual incidents depicted, and so forth) that the battle and the painting did share.

The relationship between a real-world event and a painting may look like an extreme kind of example to choose, since the level of real events and the level of pictorial representations might seem excessively remote from one another. However, it is hard to see how they are more remote than the level of real events is from the level of processing units in the brain, or than the level of processing units in the brain is from the level of spoken or written utterance. Moreover, remote or not, similar principles must apply wherever representation exists.

Both the properties of the Battle of Lepanto that must be excluded from the picture and the nonproperties of the battle that a picture must impose will be determined by the properties of static (as opposed to dynamic) representations, the properties of two-dimensional (as opposed to three-dimensional) objects, the properties of paint (as opposed to other media), and so on. In the same way, wherever representation exists, the properties of the medium in which the representation is made (or, to put

it another way, the formal structures onto which the things to be represented are mapped) must both select from and add to the properties of the original.

In particular, the properties of neural systems, some of which are general but some of which are highly species-specific, and the properties of language, almost all of which are species-specific, must both add to and subtract from anything that they represent. Indeed, since everything we seem to perceive is in fact only a representation, these principles must apply universally. For there is not, and cannot in the nature of things ever be, a representation without a medium to represent in, any more than there can be a medium that lacks properties of its own.

Perhaps the only way in which pictorial representation might mislead us about the nature of representations in general is by suggesting that if any representation exists there must also exist someone to perceive it. Thus if we talk of nervous systems 'representing' reality in the brain, it seems natural to think of someone or something—ourselves, a little person, or the soul—who sits inside our head and looks at the representation. Such beliefs have been the cause of endless pseudoproblems. For the moment, all we have to do is note that a representation does not have to be perceived by any kind of discrete or conscious agent. If the particular set of neurons in a rabbit's brain that are triggered by the appearance of a fox should happen to fire, thereby representing a fox to a particular rabbit, that representation has only to be read by the motor neurons that control the rabbit's legs. If, under similar circumstances, we are somehow conscious of ourselves seeing the fox, that only appears to be a different story, one that will be dealt with in Chapter 8.

How veridical are representations? How much difference does it make that we can only perceive through a series of representations, rather than somehow perceiving directly? One might argue, with some justice, that representation at a lower level—what our brain derives from immediate sensory input—cannot stray too far from the reality it represents. If it did, the result would surely be dysfunctional from an evolutionary point of view. We would be continually colliding with obstacles, falling from high places, consuming poisonous substances, and performing a variety of other behaviors calculated to shorten our lifespan or even extinguish ourselves as a species. Indeed, you might argue that evolution must actively select for more veridical representations by eliminating those creatures that have less veridical ones.

But this line of reasoning cannot be taken too far. There is no indication that colorblindness, astigmatism, or tone-deafness are being bred

out of us, nor that the range of our hearing is gradually extending, over succeeding generations, so that it will eventually approximate that of the dog or the bat. The sense of smell has not improved but has steadily deteriorated throughout the development of primates. Moreover, creatures like frogs or cockroaches with sensoria far poorer than ours have survived for tens of millions of years without apparent problems. Evolution does not hone and fine-tune representation to some point of near perfection. Rather it provides creatures with representational systems that are just about good enough for their immediate evolutionary needs. So long as a species can get by on what it has, there will be no selective pressure to improve.

What was said in the previous paragraph applies with even greater force to representation at the second level—the mapping from concepts to language. It was noted in the previous section that what gave our species its evolutionary advantage was not a capacity to represent in language just those things that had evolutionary significance for us, but a capacity (potential, at least) to represent *anything at all* in language, whether it was significant or not. The advantage this gave us was so enormous that members of our species can produce a great deal of dysfunctional behavior and still survive. Thus we would expect that the series of representational mappings from sense data to concepts and from concepts to language might carry us some distance from the world of reality, even to the point of representing entities that do not exist in that world.

We could even predict that a representational medium with the particular properties that language has would inevitably contain entities of the type of the *golden mountain*. A detailed account of those properties must await the next chapter, but one of them is that, subject to the constraints of a Sommers-Keil predicability tree (see chapter 3), any adjective can apply to any noun. This means that if there is an adjective, *golden*, it can apply without limit to any noun that represents the concept of a concrete object. If a mountain is such an object, the *golden mountain* becomes inescapable, regardless of the fact that there is no mountain made of gold anywhere in nature.

The remarkable thing is that the relationship between concepts and language is a two-way street. Normally we assume that a linguistic expression refers to a preexisting concept, but this is by no means necessarily the case. Linguistic expressions can equally well create concepts. Once we have heard of the *golden mountain*, we can imagine such a thing, and even what it might look like if it did exist. A friend once remarked, 'To evaluate that speech you'd really need your oxometer'.

On being asked what an oxometer was, he replied, 'It measures the percentage of bullshit'. There is, alas, as yet no oxometer in the real world. But you can imagine what it would be like, and maybe wish that you had one, too.

REPRESENTATION AND CONTINUITY

Having reviewed some of the ways in which representational systems work, we can return to the issue with which this chapter began. We have seen that between language and animal communication there exist qualitative differences, differences so marked as to indicate that no plausible ancestry for language can be found in prior communication systems. Yet evolution still requires that language have an ancestry of some sort. Thus if there is to be continuity, it must lie in some domain other than that of communication.

Communication is, after all, not what language is, but (a part of) what it does. Countless problems have arisen from a failure to distinguish between language and the use of language. Before language can be used communicatively, it has to establish what there is to communicate about.

If we perceived the world directly, this might not be so. Language might then indeed involve no more than the slapping of labels on pre-existing categories and the immediate use of those labels for communicative ends. But, as the last section showed, no creature perceives the world directly. The categories a creature can distinguish are determined not by the general nature of reality but by what that creature's nervous system is capable of representing. The capacities of that nervous system are, in part at least, determined by what the creature minimally needs in order to survive and reproduce. (They may also be influenced by what the creature's ancestors needed—but unneeded sensory powers tend to decay, witness the eyeless fish in subterranean caverns.) The categories distinguished by frogs, it would seem, do not extend very far beyond bugs they can snap at, ponds they can jump into, and other frogs they can mate with. The categories distinguished by vervets are more numerous, and those distinguished by our own species more numerous still, but the same principles apply.

Note that it is immaterial, for our purposes, how such categories are derived. They may be innate, they may be learned, or they may be acquired by the process of experience fine-tuning an innate propensity. There is good reason to believe, for instance, that some primates have an innate representation of snakes; when members of these species, raised

in isolation, are first confronted by a stuffed snake, or by anything that looks like a snake, they show signs of alarm or avoidance (in contrast to the high curiosity they exhibit towards certain other kinds of objects). At the opposite extreme, our representations of automobiles and airplanes are obviously learned.

Vervet categories seem to occupy an intermediate position. They cannot be wholly learned, for there are certain mistakes that young vervets seldom if ever make. They may generalize the martial-eagle call to owls or vultures, but they very seldom, if ever, use the eagle-call for snakes, or the python-call for leopards. In other words, they seem innately capable of distinguishing things that creep, things that walk, and things that fly. Experience is needed only to narrow those categories—of creeping, walking and flying things—to just those species that prey upon vervets.

Perhaps a word should be said about innateness, since many people still find the term objectionable. It may seem less so when one considers that all representations, whether innate, learned, or of mixed origins, share a common infrastructure. The medium onto which representations are mapped consists of sets of interconnected neurons, such that when enough of these respond to external phenomena, a particular behavioral response is triggered (the monkey's avoidance, the vervet's alarm call). Almost all creatures possess sensory cells that substantially vary their firing rate when particular features of the environment are presented to them; and they do so without benefit of experience. Let us suppose that in monkeys one set of cells responds to wavy lines, another set to rounded objects, a third set to the quality of light reflected from very smooth objects, a fourth to motions, and so on. It follows that most, if not all, of those sets of cells will vary their firing rates simultaneously when presented with a snake or similar object.

So far, there is nothing in the least marvellous about this. No one supposes that neurons are acquired through experience, or that we learn, in the traditional sense of learning, the difference between straight and wavy lines or between shiny and dull surfaces. The capacity to make such distinctions is simply part of our genetic inheritance, and it appears, if not actually at birth, at least early on in the development cycle (provided of course that those distinctions are observable in the environment). Nor does anyone express surprise if, as a result of particular experiences, the firing of all of the relevant sets of neurons should eventually trigger a particular response. Anyone would then be content to say that a learned response had developed.

Now it is true that learned responses cannot be transmitted to offspring. However, if, by sheer chance, one out of countless billions of monkeys should happen to be born with a mutation that directly linked the sets of snake-responding cells to the cells that activated avoidance behavior, then that monkey would enjoy a selective advantage over its fellows. That monkey alone could be guaranteed to react appropriately to its very first encounter with a snake, while a small proportion of its unmutated fellows in each generation might fail to survive that experience. Clearly, the genes that conveyed such an advantage would produce more offspring than those that did not. Thus, gradually, over time, the strain that lacked an automatic snake reaction would die out, leaving that reaction as a truly species-specific innate response.

On this analysis, it is hard to see what there could be to object to in the notion that there are innate concepts. Indeed, the issue would hardly need to be treated at such length were it not a fact that resistance to what are often rather oddly termed 'innate ideas' tends to grow stronger as one approaches the central citadel of language. That aspect of the innateness issue will be addressed in due course. For the present, it may be noted that, on the conceptual level at least, internal representations constitute a mosaic of innate and learned forms. If language is indeed, primarily, an additional system of representation found in a particular mammalian species, there seems no principled reason why it too should not consist of a similar mosaic.

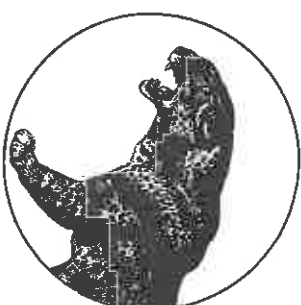
But is language really a system of representation? If it is, then we should be able to resolve the Continuity Paradox. We could search for the ancestry of language not in prior systems of animal communication, but in prior representational systems.

But before this can be done, two things are necessary. The first is to show that language may indeed be properly termed a representational system, and to describe the properties peculiar to it. The second is to survey the development of representational systems in evolutionary terms, in order to show that at least a good proportion of the infrastructure necessary for language antedated the emergence of the hominid line. If these things can be done, we can then turn to the development of hominids and determine, first, what other properties were required to create language as we know it, and second, whether it is plausible that just those properties could have been developed by the few speciations that separate us from speechless primates.

Before we begin this quest, one point in favor of the chosen course may be noted. No attempt to derive language from animal communica-

tion could hope to tell us anything significant about the origins of consciousness. If language were no more than communication, it would be a process; consciousness is a state. But if language is a representational system, it too is a state. Moreover, if consciousness too is a way of representing to ourselves ourselves and the world around us, then it may be that the origins of the two are closely linked, and that by uncovering the one we may also uncover the other.

2



Language as Representation: The Atlas

If one is to show that the antecedents of language are representational, the first tasks should be to show that language is indeed a representational system, and to demonstrate the crucial properties of that system. It may be well to begin by clarifying just what it means to say that language is a representational system.

Two possible meanings can be distinguished from the start. Take, for example, an atlas and a handbook of itineraries. Both of these could be regarded as representations of a particular geographic area. The atlas contains a series of maps that correspond in sum to a representation of that area (although, as was noted in the previous chapter, many things that are in the area will not be in the maps, and many things that are in the maps won't be in the area). We might want to say that the atlas constitutes a fuller representation of the area than the handbook does. But this is not necessarily the case. We could in principle increase the number of itineraries in our handbook until they crisscrossed the entire area and effectively covered the same terrain as the maps.

But even if they contained identical information, the two would still represent that information in rather different ways. The atlas would contain the information in a static fashion, maintaining the proportional relations between towns, rivers, mountains, and so on that obtained in nature. But if we wanted to go from X to Y, or from Y to Z, we would have to construct the entire route for ourselves. Moreover, while the atlas might provide some of the necessary information, it would not provide us with any means to compute our itinerary. We would have to figure that out for ourselves. On the other hand, the handbook would not maintain

proportional relations. Merely by looking at it, we could form no estimate of relationships between X, Y, and Z such as the distance between them or whether one lay east or west of another. Nor could we determine the general surroundings of X, Y, and Z—whether they lay on plains or in valleys, whether there were lakes or mountains nearby.

Is the kind of representation that language provides more like that of the atlas or more like that of the handbook of itineraries? The comparison of language to a map is, of course, by no means an original one, indeed it may seem rather obvious. But the ways in which language really resembles a map are not necessarily the ways in which language has been said to resemble a map. Perhaps the best known exponent of the map = language idea was Alfred Korzybski, the inventor of general semantics, who popularized the expression 'the map is not the territory'. Of course it isn't, but the ways in which the map differs from the territory are not the ways in which Korzybski thought it differed. There are at least three major problems with Korzybski's approach.

First, Korzybski seems to have believed that language mapped the world of experience directly. He certainly did not regard language as a remote or mediated mapping, a mapping of concepts that in turn derived from the processing of sensory inputs. Second, he seems to have believed, in common with many people who talk about representations, that representations can represent with an absolute verisimilitude, and that if they do not—if there are properties of the representation not shared by the thing represented, or vice versa—then this is a deficiency of the mode of representation that can and should be put right.

Korzybski failed to appreciate that *simply by virtue of being representations, representations cannot represent with absolute verisimilitude*. In other words, you cannot have a representation without its own properties, and these properties must be imposed on what is represented. It follows from this that it is a waste of time to try to tidy up language, to make it more logical and more realistic, as Korzybski and his followers did. Language is what it is. Since it is an adaptation specific to our species, we are not going to be able to replace it by anything different, and we would be better off simply trying to understand it, rather than trying to change it.

The third problem with Korzybski's approach is that language is not a map only. The answer to the question asked above—whether language most resembles an atlas or a book of itineraries—is that it resembles both. Although neither is or possibly could be an exact analogy (for every system of representation has properties unique to itself), there are aspects of

linguistic representation that are weakly analogous to those of maps and other aspects that are weakly analogous to those of handbooks of itineraries. In this chapter we will consider the maplike representation.

MAPPING REALITY

In the previous chapter it was suggested that our knowledge of the world, or, for that matter, any creature's awareness of its environment, was derived by a series of mapping operations. The first of these, the level that we share with other creatures, is from objects in the real world, via the organs of sense, to specialized networks of cells and their connections in the brain. But can we say that these networks directly constitute a level of concepts that is then mapped onto language?

Put another way, the question is: Do creatures other than ourselves form concepts? This is not a straightforward question unless we suppose that 'a concept is a concept' for all species that have concepts. Consider again the vervet monkey and its alarm calls, specifically the one for 'leopard'. To use this call effectively, vervets must be able to distinguish (in a large majority of cases) leopards from nonleopards. Moreover, given that they might perceive leopards from a variety of angles, with a variety of degrees of occlusion (due to intervening grass, bushes, tree branches, and so on), it cannot be the case that only some single stereotyped presentation of a leopard triggers the leopard call.

But we cannot conclude from this that vervets have a concept of 'leopard' in the same way that we have. We noted that the call is given only in response to a leopard's actual appearance, whereas we can think and speak about leopards in their absence. Can vervets think about leopards (dread them, wonder how best to cope with them, and so on)? Or, to ask a perhaps slightly more answerable question, are all the possible manifestations of leopards individually linked to the alarm-giving areas of the brain, as in figure 2.1a, without being in any way linked to one another? Or are they linked to one another, as in figure 2.1b, so that any manifestation of leopards triggers the whole conjunction, which in turn triggers the alarm?

If we were talking about frogs or humans, there would be no difficulty in answering this last question—negatively for frogs, positively for humans. Frogs react quickly and effectively to bugs that fly past them, but this by no means implies that they have a concept of 'bug'. Indeed, we can be pretty sure that they do not, or at best that their concept of 'bug' both under- and overgeneralizes to a rather gross extent. For instance,

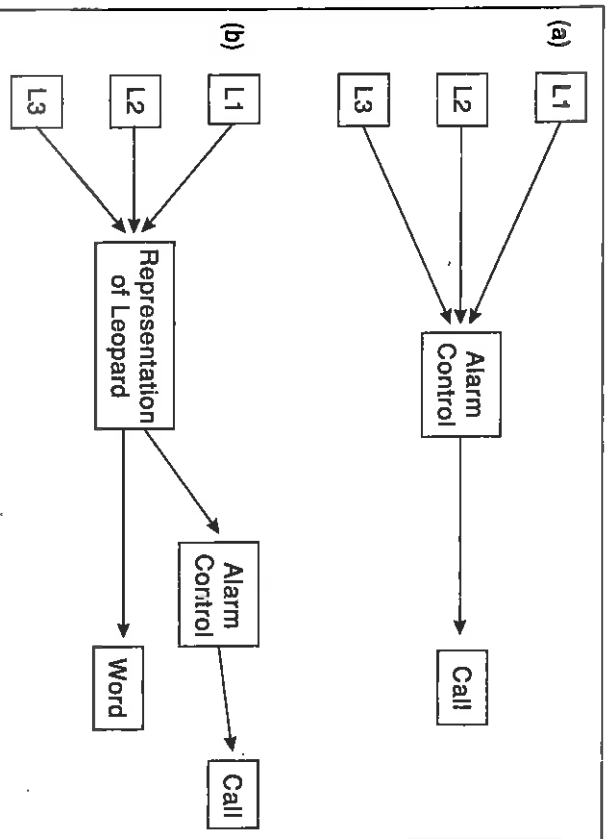


FIG. 2.1. Possible systems for categorization of sense perceptions by vervets (a) and humans (b). L1, L2, and L3 stand for different perceptions of leopards.

they will overgeneralize by snapping at bug-sized pellets that are flipped past them, but will undergeneralize by totally ignoring motionless bugs even when no other food source is available. The most parsimonious explanation of their behavior is that networks of cells that respond to rapid movement and small rounded objects are directly linked to the snapping reflex, and that there is nothing more sophisticated than this inside the frog's brain.

In our own case there is a very different story. Suppose that we are alone in a house late at night and hear a sound that we do not immediately identify. Unless we are in an abnormally anxious state we will not immediately respond to it. Rather we will listen intently, and try to identify the sound if it is repeated. In human terms, this means that we will *try to provide a linguistic description* for the sound. Only when we have done this (called it a *creaking shutter*, *cat trying to get out*, *possible burglar*, or whatever) will we take the appropriate action.

There can be little doubt that the case of the vervet is intermediate between those of the frog and our own species. At some stage in the evolution of species, some kind of linkage began to form among those perceptions that had evolutionary consequences (life-threatening or life-

enhancing) for the creature that received them, given that the perceptions caused the creature to behave in similar ways. For instance, a leopard's spots, a leopard's roar, and a leopard's smell might originally have caused reactions in quite different parts of the brain, but the fact that all provoked a similar result (flight) may have helped to create a level of processing on which all three were neurally linked. For reasons that will become apparent later, saying this is better than saying that linkages developed among perceptions of the same object or class of objects. The result was the formation of categories; rapid and accurate identification of category-membership became a crucial factor in the survival of individuals.

In the case of mature members of our own species, it is pretty clear that we react to our perceptions of particular objects and events (a noise in the night, an object on Aunt Lucy's dressing table, an unexpected reaction by a neighbor to some innocent question) by trying to map them onto some pre-existing concept that has a linguistic representation (*a burglar*, *a scent*, *pry*, *paranoia*). In other words, our moment-to-moment functioning in the world relies, unconsciously but quite implicitly and completely, on our having the equivalent of a map of reality which includes all the things that, at least for us as a species, are in it. This map enables us to orient ourselves rapidly to the fluctuations of the environment and to prepare appropriate responses to them.

But let's stop here and consider for a moment what kinds of things are in the map, what kinds of things are in reality, and what kinds of relationships exist between them.

'CONVENTIONS' OF THE MAP

In an ordinary map, we seem to find a direct symbolic relationship between objects in the mapped terrain and objects in the map itself. A church, for instance, may be represented by a cross, a railroad by a crosshatched black line, and a pond or lake by a blue blob. Note however that much variety in the terrain is erased in this process. A real church may be Catholic, Episcopalian, or Pentecostal, it may or may not have a tower or a spire, it may vary within wide limits with respect to its size, building materials, and style, but regardless of all this it will be represented by a cross, if it is represented at all.

But even on a map, representation may be much more indirect than this. Take a map that shows rainfall for a given area and indicates that the average annual rainfall at a particular point is exactly twenty-five inches. Now, there may never have been and there may never be a year

in which the rainfall at that point measures exactly twenty-five inches. Similarly, the map may indicate that the population of a given county falls between thirty and forty persons per square mile, although if that county contains a few towns in the middle of a wilderness, every actual square mile may contain either more or fewer persons than the map suggests. What the map shows in these cases is not so much a representation of reality as an abstraction from it. It does not show what there is in an area (the cross/church relationship) but what relationships hold between one area and others—how some areas are wetter or drier, or more or less populous than their neighbors.

The relationships in such maps are conventional; they were arbitrarily and quite consciously and deliberately chosen by cartographers. This is, of course, no longer the case when we turn to species-specific mapping of reality. Here, the picture is also more complex, because, as already noted, at least three distinguishable mapping processes are going on: from reality to sensory perception, from sensory perception to categorization, and from categorization to language. The network of relationships that these processes entail can perhaps be made clearer if we consider four categories, already mentioned in this book, that are represented respectively by the words *leopard*, *burglar*, *paranoia*, and *unicorn*. These categories, in the order given, represent points which have an increasingly tenuous linkage with anything one might call 'the real world'.

Since we shall be obliged to keep switching among at least three levels (the level of what may be objects in the real world, the level of concepts, and the level of words), the discussion that follows will be confusing unless the three are systematically distinguished in some way. For convenience, then, objects that are normally regarded as being (and may actually be) in the real world will appear in an orthographically neutral manner (*leopard*); concepts (as well as 'categories', 'prototypes', and similar terms) will appear in quotes ('*leopard*'); and words will appear in italics (*leopard*).

You might want to say that *leopard* corresponds to a concrete reality. Even if this is so, the route by which the correspondence is established is not necessarily more direct than it is in more abstract cases. You might want to say that various perceptions of a leopard—characteristic smells, sounds, and visual presentations—were somehow fused into a conceptual category, and that this category was then labeled *leopard*. Now, pretty well any vervet has perceived a leopard, but how many of us have? Some of us may have first encountered *leopard* in a story or a school textbook without having any very clear idea of what it was. In-

deed, the fact that we can say things like *What's a leopard?* shows that to use words in a meaningful way we don't need to have the faintest idea what they represent.

Suppose someone should answer such a question by saying, *It's an animal that eats other animals, it lives in Africa, it's related to the cat but much bigger, and it has spots*, and that only later on could we be shown an actual picture of a particular leopard. Then what might look like the 'natural order' of things is completely reversed. Instead of proceeding from object to perception, from perception to concept, and from concept to word, we have proceeded from word to concept (we may, after hearing the definition of *leopard*, have only the vaguest idea of what one might look like, but we would have a pretty good idea of one), and perhaps later, while reading an illustrated magazine, for instance, we might proceed from concept to perception. The final stage of the process, from perception to object, need never happen. We may never actually see a real (or even a stuffed) leopard.

Of course this can only happen nowadays. Phylogenetically speaking, things surely followed a different course. In our speechless ancestors, phenomena of certain kinds gave rise to perceptions of those phenomena. Then, either clusters of perceptions were joined to set the parameters of a concept, which was subsequently labeled, or the emergence of language itself was what linked related perceptions together.

But the way in which things came into existence does not exhaustively determine either their nature nor their future relationships. All kinds and levels of representation acquire, simply through having come into existence, some degree of autonomy. They are things in their own right, as well as representations of something else—the picture of the Battle of Lepanto is a picture on a wall, not a battle. The autonomy of representational levels is at least as great in the brains of animate creatures, since the neural infrastructure that supports those levels is a biological mechanism that, unlike a painting, can grow and change.

The scope of this autonomy becomes apparent as we proceed to our other three concepts, 'burglar', 'paranoia', and 'unicorn'. No matter how indirect the representation, a clear linking relationship exists among leopard, 'leopard', and *leopard*. Much the same, you might say, is true of burglar, 'burglar', and *burglar*. But there are some very important differences.

As we saw, even things like leopards can be identified on the basis of secondhand information. But leopards can also be identified by the ways in which instances of them present themselves directly to our senses.

The same is not true of burglars. While a cartoonist may represent 'burglar' by a drawing of a burly yet furtive individual in a cap, black eye-mask, and striped pullover with a bulging sack over one shoulder, and while we may recognize this stereotyped representation, none of us really believes that each, or even any, burglar necessarily looks like this.

Moreover, while identification of x as a leopard implies that x is, was, and always will be a leopard, identification of x as a burglar does not necessarily convey any comparable implication. A *burglar* is simply someone who has burgled, yet it is not just anyone who has burgled. Imagine an individual, respectable nowadays, who in his youth had committed one minor burglary for which he had never been convicted. Given our laws of libel, you would be unwise to refer to him as *that burglar*, X . Moreover, *burglar* can be qualified in ways that *leopard* cannot. You can have a *reformed burglar* or a *would-be burglar*, but not a *reformed leopard* or a *would-be leopard*. In other words, what lies at the heart of 'burglar' is not a bundle of sensory perceptions, but a particular behavior.

Is this not equally true of 'leopard'? So far it has been assumed that concepts arise from the linking of related perceptions, that are all, in some still rather vague sense, 'perceptions of the same thing'. Now this appears too simple, too unidimensional. Many concepts, perhaps all, are principally determined by function and by the evolutionary relationship that exists between us and their referents. Our concept of 'leopard' is a unified one, in part at least because we identify its referent as a competitor and a potentially dangerous predator. If there were an animal that looked and behaved exactly like a leopard except that it ate grass instead of flesh, we might call it a *false leopard* or *herbivorous leopard*, but we certainly would not call it simply a *leopard*.

However, there are still some differences between 'leopard' and 'burglar'. As noted above, there are no perceptual correlates of 'burglar'. Even if we saw someone break into a house and remove objects therefrom, we could not assume that that person was a burglar—he could be the owner who had mislaid his keys. Thus 'burglar' depends on a number of quite abstract concepts, such as 'ownership' and 'property', that derive uniquely from within human culture.

This means that while there may be things that are leopards quite independently of us, there are no things that are burglars except as we define them. There may be burglar, 'burglar', and *burglar*, but burglar is defined by 'burglar' and/or *burglar*, rather than vice versa—in contrast to 'leopard' and *leopard*, which can be defined in terms of leopard.

'Paranoia' takes this process a stage further. In the case of *burglar*, there are at least criteria, objective even if man-made, that allow us to

determine whether the term applies. In the case of *paranoia*, this is not so. There are many, even among mental health professionals, who deny the reality of mental illness, or who regard it as a matter of arbitrary definition. Any two police officers, any two judges, any two members of the public even, would almost certainly agree as to whether *burglar* was an appropriate description of a given individual in a given situation, assuming that all the relevant facts were available to them. However, it is at least questionable whether any two lay persons, or even any two professionals, would agree whether a particular piece of behavior was indicative of paranoia or not. *Paranoia*, to the lay person at least, usually is taken as meaning 'an irrational fear of persecution'. But, in contrast to the case of *burglar*, there is no generally accepted or clearly articulated measure of what counts as 'irrationality'. It's a lot easier to define 'property' or 'enclosed premises' than it is to define 'reason'.

Thus there may be *paranoia*, and 'paranoia', but no *paranoia*. And yet, at least where the term is used in good faith, there should be some correlated phenomena, some abnormal behavior pattern that might seem to justify its use. In the case of *unicorn*, this is not so. There are 'unicorns' and *unicorns*, but absolutely no unicorns. *Unicorn* corresponds with no sensory input (except from our own artefacts) and has no functional justification. Even *paranoia* has a functional justification: just as the concept 'leopard' helps us to behave in particular ways towards leopards, and just as the concept 'burglar' helps us to behave in particular ways towards people who steal from enclosed premises, so the concept of 'paranoia' helps us to behave in particular ways towards individuals who express what we choose to regard as irrational fears. In the case of *unicorn*, there is not even this type of justification.

What all this shows us may be summarized as follows. The representational levels of words and concepts can be even more abstract and remote from sensory input than those of rainfall and population maps, even to the extent of creating, out of their own resources, words and concepts that have no correlates in perceptual terms or even in established cultural conventions. But if this is so, we may well wonder what it is that gives words and concepts the particular ranges of meaning that they have.

This is a question that has vexed philosophers and psychologists, even more than it has linguists, for a very long time. A traditional view is that each word represents a category and that for each category we have sets of criteria that must be met before membership can be assigned. Take *tree* and *bush*, for example: for something to be a tree it would have to have properties a , b , and c , whereas for it to be a bush, it would have to have properties x , y , and z . This does not work out too well in practice.

Size can't be involved, for a bonsai tree is smaller than any bush, nor can branchiness, for there are single-stemmed bushes and multiply-branching trees.

More recently it has been suggested that words represent prototypes rather than categories. A prototype is the most typical representative of its class. For instance, most people would agree that a thrush or a robin is more typical of the class 'bird' than, say, a penguin or an ostrich. The prototype then becomes a starting point and we determine what class something belongs to (and thus which word to apply to it) by deciding whether it is more similar to that prototype than it is to any other prototype.

This approach might seem promising, at least with respect to terms like *bush* and *tree*. It accounts, too, for the frequent fuzziness that we encounter at the borders of categories. There are vegetable objects, for instance, that we might be unsure whether to describe as *bushes* or *trees*. Prototype theory is deficient, however, in at least two ways.

First, it offers no principled account of why we have the prototypes that we do, and not others, or why we have a certain number of prototypes, and not more or fewer. For instance, why don't we divide largish vegetable objects into 'decs' (deciduous) and 'cons' (coniferous), rather than 'bushes' and 'trees'? Why do we have two terms, when we could have one, say *trush*, that would embrace both bushes and trees? Or why not a third term, *bree*, intermediate between *bush* and *tree*? For the fuzziness of the line between 'bush' and 'tree' results from the fact that there is no division between bushes and trees in nature. There is simply a continuum of vegetable forms, some larger, some smaller, some more or less branchy, upon which we superimpose the grid of our own classification. Why is that grid the way it is, and not otherwise?

The second deficiency of prototype theory relates to the limited nature of the domain it covers. It may seem helpful with regard to 'bushes' and 'trees', but when we turn to the four concepts examined above, it is less than helpful. Why would we need a prototype 'leopard', for instance? All leopards look and behave in a similar way. We are never, if we know anything at all about major predators, at a loss to determine whether something is a leopard, a tiger, or a lion.

With 'burglar' the prototype concept is superfluous in a similar way, even though membership of the class is assigned on a quite different basis: there is just one set of criteria, and one only, that has to be met for someone to be a burglar. The concept is also inappropriate, for since the criteria for being a burglar are notional rather than perceptual, it is hard

to see how the concept of 'prototype' makes any sense. With 'paranoia', again, there can hardly be a prototype in nature, since the class is a class by definition. In addition, the membership of that class may be at least partly controlled (unlike 'burglar') by idiosyncratic presuppositions on the part of the assigner. One man's paranoia is another man's rational suspicion.

A different approach will perhaps provide a coherent account of 'leopard', 'burglar', and 'paranoia' (as well as of 'bush' and 'tree'). This is based on the idea that words and concepts contain a dynamic element. They are not merely static symbols on a rigid, maplike sheet. They exist because they delimit classes each of which conditions a somewhat different set of behaviors on the part of our own species. 'Leopard' is a concept not because it represents a genetic species or a set of static attributes, but because the concept serves to trigger a set of expectations and hence potential behaviors.

For instance, if we have a concept of 'leopard' we will be prepared to meet one in a wooded place where there would be relatively little chance of meeting a lion. We will have a clear idea of its relative size and ferocity compared to other types of predator, the likelihood of its being alone, and other factors. These help to determine whether our response, should a leopard appear, will be cautious withdrawal, headlong flight, or vigorous self-defense.

In just the same way, the assignment of terms like *burglar* and *paranoia* helps to determine our response to certain phenomena in the real world. If we determine that the noise in the night is caused by a burglar, we will seek to arm ourselves and/or call the police. If the police agree that we have assigned the term correctly, they will arrest someone, and if a judge and jury decide that the police have assigned it correctly, that person will possibly go to jail. If we regard certain phenomena as constituting paranoia we will avoid the person concerned, unless that person is a friend or relative, in which case we may encourage him or her to see a psychiatrist. If the psychiatrist agrees with us that paranoia is present, then he or she may commence a course of therapy, or, if the case is severe, counsel hospitalization.

Examples such as these do indeed suggest that words and concepts are largely derived on a basis of *functional utility*. In other words, we distinguish only what we (as a species, or as a cultural group sharing common values) need to interact with in significant ways. In fact this is just what an evolutionary model of language would predict. In many creatures, objects that the senses are capable of detecting are limited to

those with which the creature may interact significantly (recall the frog and its 'bug-detecting' vision). We, with our far vaster reservoir of sense impressions, still select out of these what will significantly affect our own behavior.

But this cannot be the whole story. Consider again *bush* and *tree*. One can indeed elaborate a plausible explanation: *bush* represents things humans can hide behind, or among, whether for stalking or predator-avoidance, while *tree* represents things humans can climb (to see further, to evade predators, or to steal wild honey or bird's eggs). This explains why there is no term *trash* covering both trees and bushes (the two involve quite different sets of human behaviors) and no intermediate term *bree* (there is no corresponding behavior pattern that something intermediate between a tree and a bush would evoke). But what about bonsai trees and year-old saplings, both quite unclimbable? Why don't we call these *bushes*?

There is a further factor in the mapping of reality that we might call the conservation-of-type principle. Things are distinguished with an eye to their utility, true, but also with an eye to their consistent identification. Both needs must be satisfied. A map in which objects identical in type are denoted sometimes by one symbol and sometimes by another is clearly undesirable. A sapling *will be* a tree if it grows long enough, and a bonsai tree *would have been* a normal tree if its growth pattern had not been deliberately interfered with.

And yet nothing so far proposed explains why there are words like *unicorn*. It may well be that 'you can't get there from here', and that to explain why there should be *unicorns* and 'unicorns' but no unicorns, it is necessary to start from a completely different direction.

COMPLETENESS AND AUTONOMY

Most efforts to explain the mysteries of meaning have begun by looking at the meanings of individual words. We tend to regard the lexicon of a language as a list of items, and indeed this is how dictionaries traditionally present it. In a thesaurus, true, words are grouped according to meaning, but they are still atomic entities, sharply demarcated from their neighbors.

Neither thesaurus nor dictionary conveys any suggestion that, perhaps, the range of meaning of a word can be defined only through the ranges of meaning of its neighbors. Yet for some time in the backwaters of linguistics there has been floating around the idea that there exists something called *semantic space*, an area of meaning that the lexicon

simply carves into convenient chunks, according to principles yet to be fully understood. To some, these principles are quite arbitrary; to others, they directly reflect the perceptual equipment of our species. If we translate 'arbitrary' as 'following only the logic of the map', then perhaps both viewpoints are partly right.

If semantic space exists it should, as a minimum, represent all of real space, or at least as much of real space as our organs of sense make available. But how can a creature who is working on a plane at least two levels of representation away from reality know what real space contains? Philosophers sometimes write as if we somehow had privileged access to reality, as if we could peek at the back of the book in the way that one looks up translations of sentences in a home-study foreign language course. But there is, of course, no privileged access.

The only way we can know the world is through levels of representation, and if we seek to analyze the flow of information that our sensory representations offer us, if we seek to abstract from that flow the consistencies that might give it pattern, we depend wholly upon a further level of representation, our system of concepts. With the best will in the world we can only represent what we believe to be out there, and what we believe to be out there shades imperceptibly into what we want to be out there, or what would be convenient for us if it were out there. Suspecting from the start that our senses could not tell us the whole story of reality, we were not necessarily worried if our best guesses at what was out there were not immediately confirmed by those senses—if we did not see or hear *ghosts*, *souls*, *angels*, or *neutrinos*, or if a principle of heat, *phlogiston*, or a principle of attraction, *gravity*, should be apparent solely through its presumed effects, or if things apparently made of wood or stone or steel should in fact consist entirely of *atoms*.

In this list (*ghost*, *soul*, *angel*, *neutrino*, *phlogiston*, *gravity*, and *atom*) there should be for every person at least one thing that person believes in and one thing he or she totally disbelieves in. (Not everyone will agree as to which they are, of course.) The aim is to undermine the reader's faith in the level of words or concepts as being in any way a mirror image of reality. For all of these things were at one time of equal status: they were hypotheses about the nature of the outside world. Some seem to have been discredited, others seem to have been confirmed, some have not yet been confirmed and may never be confirmed or even confirmable, but when these terms first emerged they all represented exactly the same thing: educated guesses at what the world might contain, guesses that were not directly verifiable in terms of sensory data.

The *unicorn* represented just such a guess. The fact that most horned

creatures had two horns did not logically entail that there should be no one-horned creature. There was, after all, the swordfish, and indeed a one-horned mammal, the rhinoceros, was rediscovered by Western Europe some time after the appearance of 'unicorn'. But by then even a perceptual object corresponding to 'unicorn'—a horse-like creature with a spear like a narwhal's on its forehead—had become established, and a fullblown concept complete with behavioral attributes (extreme docility in the presence of virgins, for example) had crystallized around it. For levels of representation are indeed autonomous, and the units that compose them have a life of their own.

We are on pretty safe ground, though, if we assume that *leopard* preceded *unicorn* in the evolution of the lexicon. It seems only reasonable to suppose that the lexicon evolved over time, perhaps over a great deal of time, and that it began by abstracting those categories that were most immediately useful to our species. Subsequently it spread to cover the entire range of phenomena accessible to our senses, and beyond, since language is (among other things) a tool with which we rake through the debris of sense impressions in search of general principles or laws that will serve to guide our behavior. It is a characteristic of language that it enables us to describe anything in our experience. Even when a mystic talks of, say, 'experiences impossible to describe in words', the speaker has in fact just described such experiences in words (whether we regard such a description as adequate is another matter). But long before the lexicon could describe everything, it had developed in another direction that has yet to be discussed.

THE DYNAMIC ELEMENT

So far we have dealt only with those units that relate to entities. A system composed of such units might be adequate to represent the world, if the world were a museum and everything in it stuffed. In a living world, the behaviors of entities must also be represented. We may well want to ask why they are represented in the way that they are and not otherwise.

Take simple sentences like *A cow is grazing* or *A bird is flying*. If we look at the events these sentences convey, what we actually see in each case constitutes a single image, a creature-and-its-behavior. It is possible to imagine a language in which things were arranged quite differently. In human sign language, for instance, it would be possible to make the handshake that corresponds to *bird* and simultaneously extend the same hand in an undulant motion to indicate *flying*. In fact (and the fact is significant) at least the American version of sign language does

not avail itself of this opportunity. The handshake that indicates *bird* is followed sequentially by the handshake that indicates *flying*. In other words sign language, like spoken language, simply follows the patterns of the human faculty that, as will be shown, underlies all language, whether signed or spoken.

The subject-predicate distinction in language is so fundamental, and so much taken for granted, that it is perhaps worth emphasizing that it corresponds to nothing in nature. There is no sense in which we can perceive a creature without simultaneously perceiving that it is doing something—sleeping, grazing, walking, flying—and no way in which we can see a behavior like grazing, flying, sleeping, or walking without simultaneously seeing the creature that performs it. Constant behaviors of some sort are part and parcel of being a creature, and if language merely mirrored reality it would mirror this also. Why doesn't it?

You might want to answer that some principle of economy operates here. If one had to have separate words for cow-grazing, horse-grazing, sheep-grazing, deer-grazing . . . , and then for cow-running, horse-running, sheep-running, deer-running . . . , and so on, for every behavior of every creature, the lexicon would be very much larger than it is. But principles of economy are often only a luxury of hindsight. Whoever started the lexicon can hardly have envisaged running out of memory storage, and indeed it remains to be proven that humans could not learn the extra tens or hundreds of thousands of words that unitary terms for subject-predicate conjunctions would entail.

It seems likelier that language evolved the way it did because concepts of entities—and in particular, of other species—preceded concepts of behaviors. Some evidence relevant to this will be considered in later chapters. For the present we may note that behaviors are more abstract things than entities. We saw earlier that words purporting to denote entities covered a wide range extending from those that had a fairly solid foundation in experience to those that had absolutely no foundation in experience at all. But all behaviors involve some degree of abstraction, if only because they can be predicated not of just one kind of creature, but of any kind to which they can be attributed.

For instance, the things that birds, bats, butterflies, kites, airplanes, balloons, and flying squirrels do in the air are very different, but all of them are described as *flying*. A single feature, 'moving through the air', is abstracted away from countless variables ('with two/four/no wings', 'high/low', 'in a straight line/zigzagging', 'quickly/slowly', and so on). You might think that this degree of abstraction merely mirrors our relative indifference to the way things fly (something we can't do naturally

ourselves) as compared with, for instance, the way things walk. For a person can be said to *stride*, *lope*, *trot*, *amble*, *stumble*, *stagger*, *waddle*, *sauter*, *stroll*, *stalk*, *reel*, *shamble*, *shuffle*, *slouch*, *lump*, *hobble*, *tramp*, *trudge* or *strut*. But all this means is that the map is more detailed in some regions than in others, not that it is any less abstract.

For instance, *trot* may be predicated of people and horses, *waddle* of people and ducks, but people do not really move like ducks or like horses. In each case, only one or two features of duck or horse movements that happen to correspond in some sense to features of human movements have been abstracted from what are quite complex, and quite different, movement patterns. Or, in another type of case, the difference between *tramp* and *trudge* lies less in the physical movements that distinguish these kinds of walking than in the suggestion that more effort and/or less willingness is involved in *trudging*. In other words, the sense of such items is what we can infer from prior knowledge or subliminal clues about the walker's state of mind—an extremely abstract procedure.

A different kind of abstractness attends words like *bring*. In English we can say *they bring Mary presents* but in some other languages you have to say things like *they carry presents go give Mary*. Would you want to argue that *bring* was 'really' a single action that the other languages split up, or would you rather say that an action of bringing 'really' incorporates three distinct actions?

This issue has in fact been argued both ways, although it should be obvious that neither way is more or less natural than the other, since the semantic domain of any verb is relatively arbitrary. Take what might appear to be an uncontroversial single-action verb like *hit*, for example. In order to hit someone, it is necessary to clench one's fist, withdraw one's arm, and then extend that arm with some degree of rapidity and force so that the clenched fist meets its target. In other words, the 'simplest' action can be broken down into its set of component actions.

However, the word *arbitrary* was qualified by *relatively* because once again the criterion of functional utility will play its part. One could, in describing a fight, say that *Bill clenched his fist, withdrew his arm, and then extended it violently and forcefully so that the clenched fist connected with John*, and if we were holding up a mirror to nature that might be what we would see and thus perhaps what we should say. However, no significant meaning is lost, and much time is saved, if we simply say *Bill hit John*. Verbs represent those chunks of behavior (selected out of a much wider range of possible chunks) that are functionally significant for our species (or, at a later stage, for our culture), just as nouns represent those entities that have an evolutionary or cultural significance for us, selected again from a wider range of possible entities.

But behaviors (including states, and even states of mind) are not the only things that can be predicated of entities. There are also attributes—particular properties of size, color, temperature, age, and so on—that we may attribute to particular entities, and that serve the purpose, among others, of distinguishing two similar objects from one another (*the GREEN book, not the RED one*).

Colors constitute an interesting case, for the mapping relation between reality and language can be spelled out here in rather more detail than elsewhere. Brent Berlin and Paul Kay have shown that basic color terms (that is, color terms that do not derive from specific objects, like *orange*, and are not compounds, such as *dark green* or *navy blue*) are acquired by languages in a fixed order. If a language has only two basic color terms, these will mean roughly 'dark' and 'light'; if it has three, they will mean 'dark', 'light', and 'red'; if it has four, 'yellow' or 'green' will be added to these three, and so on.

These stages reflect the system of color discrimination common to all primates. Roughly, four paired sets of neurons respond to light of different wavelengths, the pair that responds to light/dark distinctions being phylogenetically the oldest. The pair that responds to red/green (one set firing with maximal frequency to the wavelength that gives subjective red and minimally to that which gives subjective green, the opponent set reversing these firing rates) is perhaps the second oldest, and so on. In other words, the distinctions that have been longest within the power of our remote ancestors to make are the most likely to be represented in language, while more recent ones are progressively less likely, and those that depend on cultural rather than biological factors (the *browns*, *pinks*, and so on) are rarer still.

The mix of liberties and constraints that this area shows is perhaps typical of the way in which the lexicon as a whole represents reality. Nothing in our neurological makeup determines absolutely how we shall divide up the spectrum. Anything from two to eleven basic colors may be represented, and, contrary to what is sometimes suggested by critics of this work, no one is claiming a necessary connection between levels of technological development and the number of colors represented. However, languages are not free to simply select what colors they will represent by basic terms. They can, of course, select any type of color-description for particular objects, but for general terms, applicable across the full range of lexical items, they are forced to decide among a set of alternatives that are, in part at least, neurologically determined.

In another respect, however, color terms are far from typical of attributes in general. Although they may derive from opponent pairs of cells, we do not feel any kind of binary opposition between *red* and

green, for instance, or between *blue* and *yellow*. These represent distinctions within a continuous spectrum. Other attributes, however, come in pairs (*hot* and *cold*, *young* and *old*, *rich* and *poor*, *long* and *short*, *wet* and *dry*) and yet, unlike color terms, they seem to lack any specific neutral substrate. For instance, it would be bizarre indeed if we found that we had cells that fired with maximal frequency when confronted by rich people and with minimal frequency when confronted by poor ones.

Why are adjectives paired in this way? For most adjectives such pairs represent a continuum (those that do not, such as *married* or *single*, can be ignored for present purposes). It is not immediately obvious why a continuum cannot be represented by a continuum. In other species it often is. For instance, a robin indicates its willingness to defend its territory by the intensity of its song; a bee indicates the quality or quantity of a honey find by the vigor with which it dances, and so on. You might think that some language somewhere might have represented temperature, for example, by a continuous vowel sound, short for very low temperatures, gradually lengthening for higher ones. Such a process might seem at first sight to be much more informative than one of simply saying whether something is *cold* or *hot*. Yet no known language has ever chosen this process, and probably none ever will.

For the function of adjectives is not to place the attributes of creatures on any kind of absolute scale. To do so would be impossible, in view of the many and often very different entities to which a given attribute may be attached; for attributes, like behaviors, are not normally limited to single species, but are assigned across the board. This effectively makes the sense of adjectives dependent on the nouns they qualify. A small elephant is bigger than a big donkey, a long letter is shorter than a short novel, a cool oven is hotter than a hot summer's day. Attributes are predicated of things in order to place them relative to the norm for their class: a *small elephant* means something that is small for an elephant, rather than an elephant that is small, and so on.

The fact that for many adjectival pairs there may be intermediate terms (*middle-aged*, for instance, between *young* and *old*) or even pairs of such terms (*cool* and *warm*, between *hot* and *cold*) does not really affect the argument. These terms, too, merely divide a continuum into slightly smaller chunks, allowing for a closer approximation to the class norm, rather than representing that continuum iconically.

Thus the level of representation given by the lexicon abstracts away from and interprets (sometimes over-interprets) the flux of experience. By doing this, it derives a wide range of entities, together with the behaviors and attributes that can be predicated of these entities. This range

of entities, behaviors, and attributes forms an inventory of all that appears to us to be in the world. But there are still important properties of the inventory that have not been discussed, and to these we now turn.

THE HIERARCHICAL ELEMENT

To say merely that the lexicon provides us with an inventory is still to suggest that, like a set of dictionary entries, its contents are unstructured. Such a lexicon is possible to imagine. Suppose you spoke a language such that, when someone asked you what the word *spaniel* meant, you could point at an actual spaniel, but if there were no spaniel in sight, you would be at a loss to define it. This is what would happen if the lexicon were merely a single-level mapping from reality onto words. Then the domain of each word would be defined only 'horizontally', by the bounds of its neighbors, much as the domains of different governments are represented on a political map of the world, and when asked what a spaniel was, we would have no recourse other than to say something like, *well, it's rather like a setter or not too far from a dachshund, only shorter and higher off the ground*.

In fact, we are able to say that a *spaniel* is a kind of dog used in hunting, and if our interlocutor (from another planet, perhaps) were to ask us what a dog was, we could reply a *smallish kind of mammal*, and if we were then asked what a mammal was, we could reply an *animate creature that suckles its young*. We are able to do this by virtue of the fact that the lexicon is hierarchically structured, that is, marked by levels of ascending generality, like *spaniel-dog-mammal*, with each term in it being superordinate to some terms and/or subordinate to others, along the lines illustrated in figure 2.2.

Note that this hierarchical structuring extends throughout the lexicon. Take any word, say *anger*; *anger* includes a range of other words like *fury*, *annoyance*, *rage*, *irritation*, and so on, but at the same time is itself a member of a set that includes *love*, *envy*, *gratitude*, and *disappointment*, all of which in turn fall under *emotion*. What this means is that any word in any language is not merely intertranslatable—that is to say, capable of being converted into a string of other words in the same language—but falls into its place in an intricately patterned structure of words that forms, as it were, a universal filing system allowing for rapid retrieval and comprehension of any concept.

There can be little doubt that this enormously efficient filing system, organizing as it does our entire knowledge of the world, forms one of the major factors in our success as a species. Yet it seems unlikely that this

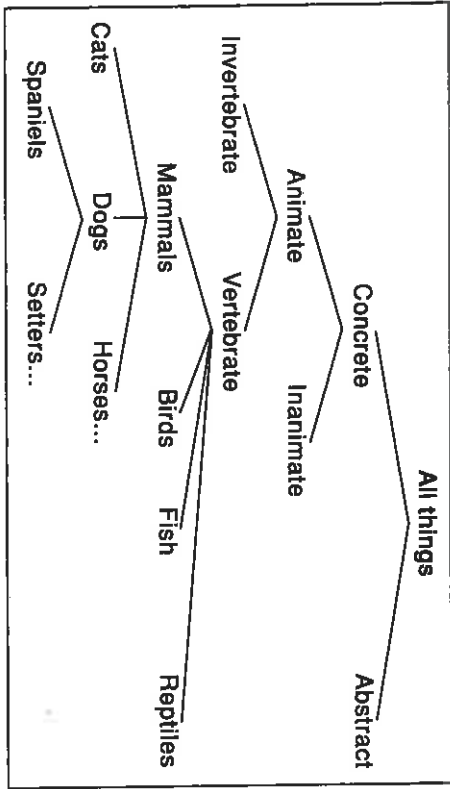


FIG. 2.2. Hierarchical structure of lexical items

system was automatically achieved simply by the emergence of language. As noted above, an entire lexicon did not emerge overnight. Moreover, there is considerable structural, cross-linguistic, and historical evidence that even in languages that exist today, what are claimed to be the oldest nouns among those referring to other life-forms, do so at the approximate level of the species (that is, words like *dog* were used earlier than words like *spaniel* or *mammal*).

This, again, is pretty much what we would expect, if meaning was originally based on functional interaction with other creatures. Lexicalization at the level of the phylum or order would have been too indeterminate, lumping together creatures that triggered different behavioral responses. On the other hand, lexicalization at the level of the subspecies or variety would have been overly repetitive, assigning different labels to creatures that all had to be dealt with by using a similar set of behaviors.

CONTIGUITY CONSTRAINTS

A further constraint on what can be lexically represented is one that involves spatiotemporal contiguity. It has often been noted that no language has words with meanings like 'a left leg and left arm' or 'every other Friday'. No language has a word that embraces the meanings 'red' and 'green', unless it includes the meaning 'yellow', for only contiguous sectors of the spectrum can be lexicalized. In other words, a minimal

condition for word status is that the referent consist of an uninterrupted piece of matter or time or space. But contiguity constraints can be much subtler than this.

Consider figure 2.3, the four areas of which can be lexicalized in a variety of ways. Some languages use a single verb to express the concepts of 'existence', 'location', 'possession', and 'ownership'. Some use a separate verb for each concept. Some, like English, use one verb for 'existence', 'location', and 'ownership' (*there IS a book, your book IS over there, that book IS mine*) and another for 'possession' (*I HAVE a book*), and there are other possible patterns. So far, however, no language has turned up that uses the same verb for 'location' and 'possession' but a different verb for 'existence' and 'ownership', or that has the same verb for 'existence' and 'ownership' but a different verb (or verbs) for 'location' and 'possession'.

In other words, contiguity constraints seem to exist even within domains that are highly abstract. This lends support to the idea that semantic space may be real, may be represented in actual configurations of cells and connections in the brain. It has been known for some time that the brain contains a literal mapping of the motor and sensory areas of the

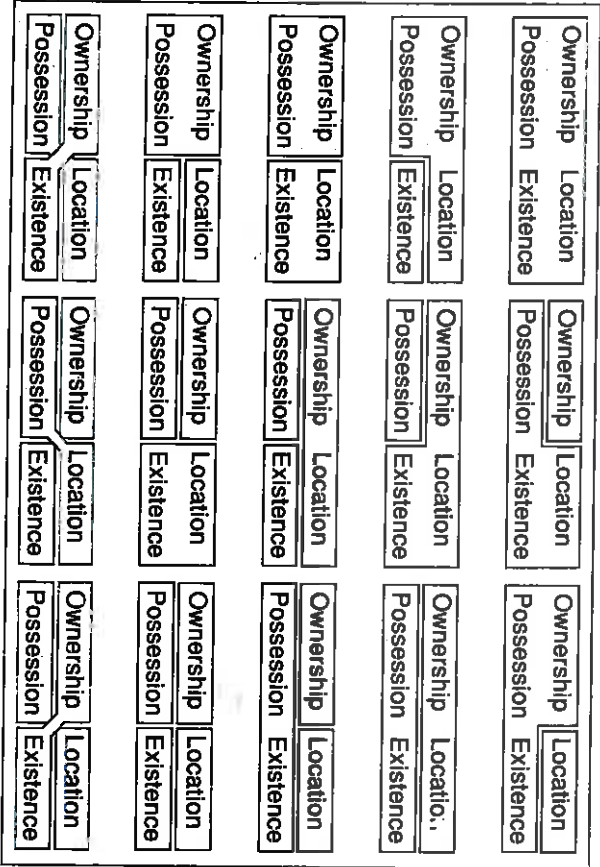


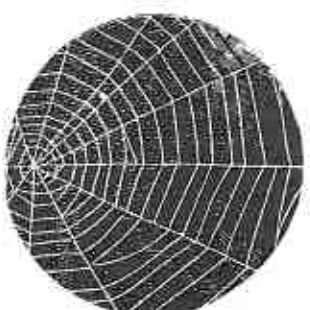
FIG. 2.3. Semantic space for four relations. Boxes indicate domains of individual words. Configurations of the lowest level are illicit.

body. The groups of neurons that receive and send messages to and from the various bodily organs are localized in the brain in a manner that largely replicates (although with considerable distortions of size) the spatial distribution of those organs within the human body, as shown in diagrams of the 'sensory homunculus' and 'motor homunculus' found in most introductory neurological textbooks. It is conceivable that some comparable form of organization may exist in the neural representation of concepts, but what such an organization might be like, and what principles might control it, are topics for the research programs of the future.

Thus language, at least as far as its component words are concerned, is indeed a system of representation in the true sense of that term. It is not a system that passively mirrors what it represents, but rather one that creates a new and parallel world constrained by the laws of its own nature just as much as by the nature of the phenomena that it represents. Within that world, meaning is largely determined by evolutionary (or cultural) significance, by type consistency, and by contiguity effects.

Correspondence with any kind of counterpart in the real world is not obligatory because language does not exist in order to give a rationalistic, textbook account of the real world. Language is an evolutionary adaptation of a particular species, and as such functions for the benefit of that species. If it seems convenient to members of that species that there should be witches or that human physiology and psychology should be based on four humors, then there will be *witches* and *humors* (as well of course as 'witches' and 'humors'). Otherwise, the world will be divided up in different ways. If language did not perform such tasks, we would quite literally have nothing to talk about.

Yet even now we have looked at only one side of linguistic representation. The other remains as a topic for the chapter that follows.



Language as Representation: The Itineraries

At the beginning of chapter 2 it was pointed out that if language is a system of representation, it functions as such a system in at least two ways, ways comparable to those of a map and a handbook of itineraries. For representation of meaning is not limited to the individual words that compose the lexicon, but is expressed in the ways those words are put together. A map tells you what there is in a terrain, but a book of itineraries tells you how to make journeys across that terrain. It will not be possible, ever, just to make your way across the terrain as your fancy pleases. Indeed, the area covered by the itineraries available to you will usually be only a minute fraction of the area covered by the map.

Our map is the lexicon, our itineraries are the sentences that we hear and utter. Like itineraries, they are constrained by the terrain they traverse. Crossing semantic space, they are impeded by boundaries as formidable as the beeting ranges and unfordable torrents that the map indicates, boundaries that if we try to cross them yield only uninterpretable garbage like *procrastination drinks serendipity* or *the hole in neuroscience precluded leopards*.

We may like to think that it is not the nature of the map but the nature of nature that renders these sentences meaningless, but that cannot be so. We are perfectly able to say things like *familiarity breeds contempt* or *procrastination is the thief of time*. If familiarity can breed contempt, why can't procrastination drink serendipity? Of course the answer is that familiarity does not breed contempt; 'familiarity' breeds 'contempt'. The map is not a map of the world but a map of our concepts of the world. What is in it is not what is in the world but what we are capable of conceiving as being in the world. We have chosen that *familiarity breeds*

contempt should mean something. But we could equally well have chosen that *procrastination drinks serendipity* should mean something.

Suppose there exists a society in which all important decisions are made serendipitously, that is, by random and spontaneous choice, but only after a period of intense meditation, and only at certain propitious moments. Suppose that in that society the verb *drink* is used metaphorically for 'consume completely, destroy', just as we use the verb *breed* to mean 'create, be the immediate cause of'. *Procrastination drinks serendipity* would then simply mean that putting things off causes us to miss crucial moments of decision, just as *familiarity breeds contempt* means that getting to know things too well causes us to treat them too lightly.

But we must be careful here, or we shall fall into the trap of Wittgenstein's 'language games', the theory of 'meaning as use'. This approach holds that things mean what we choose them to mean, what society decides that they should mean—and it is a useful gambit against naive realists who believe that language merely labels what is already there. However, if it is taken too far it leads one to suppose that there are no constraints on meaning, that concepts can be created in any way we choose, and that words can be allocated whatever range of meaning we may decide to give them. That this is far from being so should become more apparent as this chapter proceeds.

Underlying the sentences we utter are three kinds of structural consistency: predicability, grammaticization, and syntax. We are free (to a limited extent) to tamper with only one of these, the first. These are the forces that shape our sentences, without which there would be no sentences. And although what they produce may seem equivalent to a list of itineraries through semantic space, they do not actually exist in the form of such a list. They do not directly state what sentences you can and cannot say. Instead, these three things together constitute a complex machinery that produces itineraries—sentences—quite automatically, as automatically as the various organs of the spider combine to produce its complex web.

And perhaps this is the most remarkable single fact about language. The machinery for producing sentences is so complex and subtle that after perhaps two hundred millennia of using it and nearly three thousand years of writing about it and several decades of studying it systematically, we are only just now beginning to understand how it works. You might think that to use such a complex instrument would cost some effort, and that, just as the most accomplished mathematician may have to employ conscious thought in the solution of a problem, so might we in the assembling of sentences.

But this seems hardly ever to happen. Although we may say that we often 'have difficulty in communicating' or 'don't know exactly how to say something', we hardly ever mean by this that we find any problem in the mechanical construction of sentences (unless, as occasionally happens, our sentences get so long and complex that we forget how they began before we can end them). All we normally mean is that we are unsure of the words we need to express our exact meaning, or of the order of ideas that will make what we have to say as comprehensible or as convincing as possible. The putting together of words, once they have been selected, is carried on so unconsciously, so automatically, that we are quite unaware of the mechanisms involved or even that such mechanisms exist. Yet if we did not have those mechanisms at our disposal, our vaunted 'system of communication', for all the richness of its conceptual map, would not be very much more expressive than the grunts and snarls of beasts.

PREDICABILITY

We can say the story was interesting, and the story was true, but not the story was plump or the story was sorry. We can say Farmer Giles was interesting, Farmer Giles was plump, or Farmer Giles was sorry, but not Farmer Giles was true. (The latter is not the same as saying Farmer Giles was true to his wife or Farmer Giles was real.) We can say the fruit was interesting or the fruit was plump, but not the fruit was true or the fruit was sorry. And we can say the fight was interesting, but not the fight was true, the fight was plump, or the fight was sorry (as distinct from the fight was a sorry affair).

Here we have four entities and four qualities that are related somehow. The relation between an entity and a quality is one of predication. What does it mean, to predicate something of something? We might say it means to claim that a quality somehow belongs to an entity, or at any rate to our concept of that entity. But right away it should be apparent that when we are talking about predication we are not talking about a truly unitary relation but rather about a cluster.

For instance, a story is not interesting in the same way that Farmer Giles is plump. We can quantify Farmer Giles's plumpness with the aid of a tape measure, but there is no artifact that will help us to determine, with any measure of intersubjective agreement, just how interesting the story is. Indeed, differences between predicates can be much greater than this. If we say Farmer Giles was absent, can we seriously suppose that 'absence' is a quality and that it belongs or belonged to Farmer Giles?

We might be tempted to say that predication is no more than the linking of an entity with something that may be said about that entity. But the process is by no means without constraints of some kind. If it were without constraints, then any of the four qualities under discussion could be predicated of any of the four entities—'the story', 'Farmer Giles', 'the fruit', and 'the fight'. But we saw that they cannot be.

Again it is tempting to suppose that there are 'natural kinds', that there is something in the inherent nature of real-world entities that allows certain qualities to be predicated of them while others are barred. You might say, for example, that anything may be interesting because anything is capable of arousing interest, while only concrete objects can be plump, only abstract objects can be true, and only human objects can be sorry.

But we alone can determine whether interest has been aroused, and there would not be abstract objects in the world if we had not created them. If there were no abstract objects, there would be no abstract/concrete dichotomy. Nor would there be human objects as a class, if we had not perceived ourselves as behaving differently from the rest of creation and attributed to ourselves qualities and behaviors that we denied to other species. If we think it reasonable to say *Farmer Giles was sorry to be beaten* but not to say *the fruit was sorry to be eaten*, that is after all only a matter of judgment. We may believe that it is a sound judgment—after all, we have cut the fruit open and found nothing we think it could be sorry with—and we may hope that some superior creature from the planet of another star would agree (while eating us, perhaps) that we were sorry to be eaten, but that fruit wasn't. However, it remains true that in this case we are the judges, the jury, and the detectives too.

As detectives investigating the world, we analyze what we think to be the nature of the world. As judges and jury we examine the results of our own investigation and, not surprisingly, pronounce them to be the correct and indeed the only possible ones. This refers of course to our tacit and preconscious investigation. Over the findings of our conscious investigation, our science, we sometimes squabble like a cageful of monkeys, and we never tire of updating them. But our unconscious findings—the fundamental analysis of nature that underlies all our conscious findings and that is determined not by our conscious decisions but by our species biology—are taken completely for granted, are never altered, and perhaps cannot be altered.

Those unconscious findings, that fundamental analysis, can in part be expressed in what Frank Keil, who developed the idea from work by Frederick Sommers, terms a 'predicability tree' (see fig. 3.1). The tree

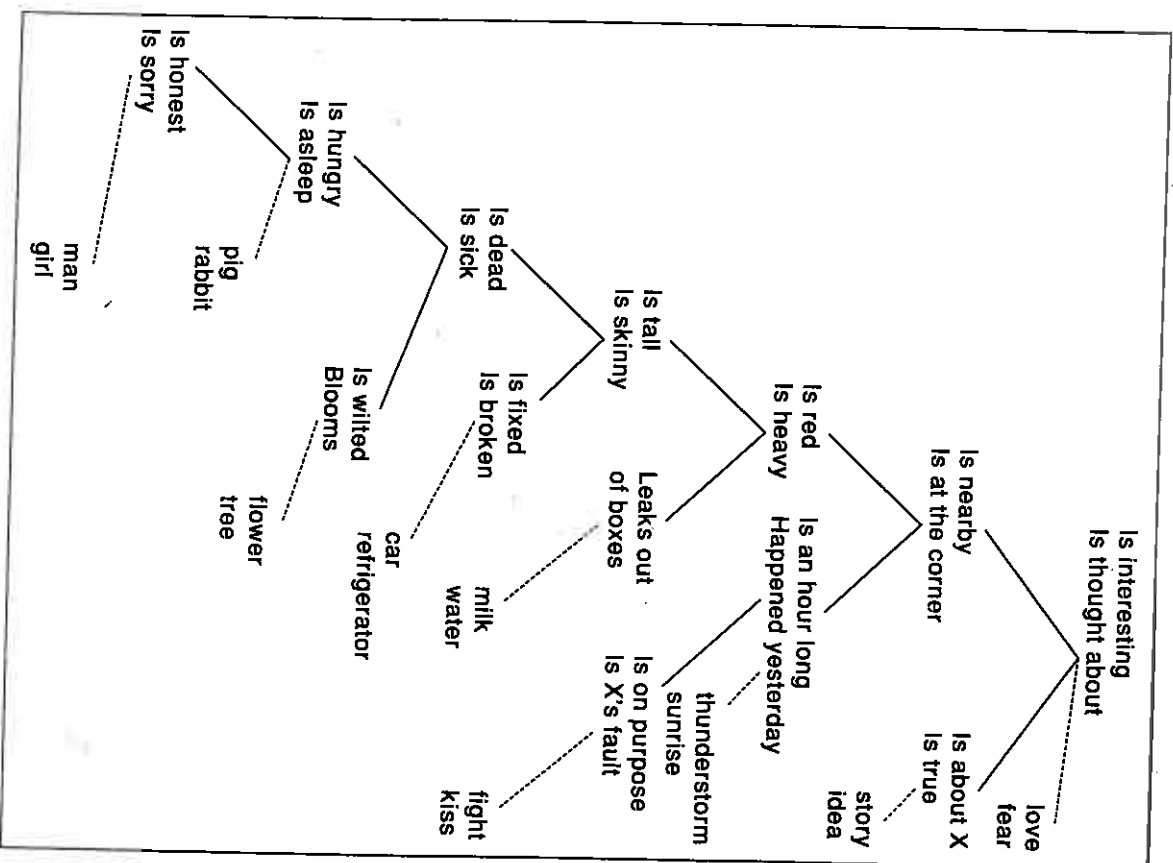


FIG. 3.1. The predicability tree. Source: Bickerton, *Roots of Language* (1981, fig. 4.7)

shows what can be predicated of what entities. A quality at the top of the tree can be predicated of any class beneath it. A quality on the main stem of the tree can be predicated of any class beneath it, but of no class above it. A quality on a side branch can be predicated only of a class on the branch below it.

Several things are worth noting about the predicability tree. First, it is binary branching. In principle, there is no obvious reason for this to be so. Why should the first node not have three branches, all leading to mutually exclusive classes of predicates and entities? We will encounter binary branching again, later on in this chapter.

Second, there is a contiguity constraint on the tree that is similar to the contiguity constraints discussed in chapter 2. There appears to be no quality that would apply to nonadjacent categories without also applying to categories between them. For instance, no quality can apply to humans and plants (the lowest and second from the lowest classes on the tree) without also applying to animals (the next to the lowest). Similarly, no word can take predicates from discontinuous sections of the tree, in other words, if we can say of something that it is both tall and hungry, we must also be able to say of it that it is sick.

Third, it seems unlikely that the nature of the tree is induced directly from experience of the world. That is, we do not seem to determine from personal observations that certain entities can, while others cannot, perform certain behaviors or possess certain attributes. Keil found that slightly truncated versions of the tree occurred among children as young as three or four. Whether the tree was learned from experience of language is another question. It's hard to test for this. The only way Keil could find out about the predicability trees of young children was by talking to them, by using language. But the fact that language obeys the constraints of the predicability tree would follow quite straightforwardly from the fact that language as a *classificatory mechanism* is constrained by the human, species-specific conceptual analysis of the natural world.

But, you may want to ask, what about 'familiarity breeding contempt', and things of this nature? If *familiarity* is an abstract noun, as it is, how can we predicate of it something that should not apply in the tree above *flower* and *tree*? The answer is that although we cannot change the structure of the tree, we can change the category membership of either entities or predicates. Keil was puzzled by children who told him that dreams could be tall until he questioned them further and found out that they regarded dreams as physical objects ("They're made out of rock," "They just got grass on them," "They turn white and go up in the sky"). Doing a similar thing from the opposite direction, so to speak, we can expand the meaning of *breed* so that it includes 'create, be the immediate cause of', thus turning it into an abstract predicate. Once this has been done, it can be applied to an abstract noun like *familiarity*.

At first sight you might think that this flexibility reduces the predicability tree to a mere tautology. So, only abstract qualities can be predicated of abstract nouns, only human ones of human nouns, and so

on—what's such a big deal about that? Nothing, if you believe that the tree and its classes of entities and qualities exist in the external universe. But the categories into which we divide nature are not in nature, they emerge solely through the interaction between nature and ourselves.

GRAMMATIZATION

Take any sentence that you might think of. Well, why not the one before this? It contains eight words. Only one of them expresses a concept that refers to something you could point at: *sentence*. Another, *take*, expresses a concept that you could at least try to demonstrate, although taking a sentence is not exactly like taking a drink or taking an umbrella (which are not like each other, either, but that is neither here nor there). A third word, *think*, expresses a concept that would be a good deal harder to demonstrate. But in what sense do the other five words in the sentence express concepts? At best they are very hard to define, and at worst they seem to be altogether devoid of meaning.

Take *any*, for instance. It doesn't, unlike *this* or *that*, specify which sentence is being referred to. Indeed, it *unspecifies*: it says 'what is said here applies to all sentences'. But *all sentences* would not have worked in this context, since you were intended to take one only. So what *any* means is 'out of all possible sentences, one, but not any particular one'. But we have now included *any* in its own definition.

Now look at *that*. It is not the *that* of *that pen* or *I like that*. Those *thats* refer to something, but this *that* seems merely to link two parts of the sentence together. *You* looks more reassuring, but again it doesn't really have any definite reference. *You* can mean anyone who happens to be addressed, or one might say, 'the participant(s) in any dialogue that isn't the speaker' (but is this book, for example, a dialogue?). Besides, its reference shifts continually—it means B if A is talking, and A if B is talking.

As for *might*, it can express anything from a rather petulant request (*You might close the door*) through a rather remote possibility (*I might do it if I could only find the time*) to something quite predictable (*You might guess he'd say that! Yes, we might have known!*). And perhaps of is the vaguest of the lot. It is a preposition without a noun after it, at least without an overt noun, and yet contrary to what you may have been taught at school, it is not really possible to get it away from the end of the sentence. You can't say *Take any sentence that you might think* (you can think a thought but, for some reason, you can't think a sentence), while *Take any sentence of which you might think* somehow suggests that there is already a special class of thinkable sentences out there waiting to be

taken. In fact, in the original sentence, the class was the class of all possible sentences, and the *taking* and the *thinking* of were somehow part of a single process. Moreover, *of* seems to mean no more than *that* in this sentence. It isn't even the *of* that indicates possession, itself far from transparent in meaning (*the handle of the door, the fundamentals of cognition, the friends of Eddie Coyle, the State of Massachusetts*).

It is a surprising fact that at least half the words we utter, hear, or read are like these: grammatical items (as opposed to lexical items that have some kind of demonstrable referent). Some of these items are not even full words but mere inflections, like the *-ing* in *working* or the *-ed* in *played* (many languages are much richer than English in such things). Occasionally a grammatical item can be omitted without loss of meaning (for instance, the *that* in *Take any sentence that you might think of*).

But in general, whether they are inflections or words, grammatical items cannot be omitted without changing the meaning of the sentence or making it somehow wrong (often both). No verb (except a handful like *cut* or *put*) can be used without overtly indicating whether its tense is present or past, and no noun (except for a few like *sheep* or *fish*) can be used without explicitly indicating whether it is singular or plural. Even here, agreement phenomena (*he cut it YESTERDAY, the sheep ARE grazing*) are there to show us that pastness and plurality are still present even when not overtly marked. Grammatical items, then, play as crucial a role in meaning as do lexical items, although unlike lexical items they are seldom within our power to pick and choose, and we cannot invent or add new ones.

And yet when philosophers talk about meaning they almost always talk about lexical items, usually about nouns, and most often about concrete nouns of one kind or another. The only exception is a small handful of grammatical items such as *if*, *and*, and *or* which happen to have logical significance. The rest they usually either recoil from or ignore. Willard Quine, for instance, was baffled by the fact that all finite sentences must express some kind of tense, a situation for which he could see no logical necessity.

If they don't mirror anything specific in the world of experience, what are grammatical items for? Do they have meaning, and if so, what kind? What do we mean, exactly, when we say that certain concepts are grammaticized? There are two things at issue here which we should try to separate.

Looked at from one point of view, grammatical items are simply structural pieces that hold the more meaningful parts of a sentence together, rather in the same way (to return to our 'itinerary' metaphor) as stretches of road we often find tying link together the towns or resort areas that

are all we really want to visit. But just as those well-engineered yet dreary freeways enable us to drive with minimal attention, developing our own thoughts as we travel, so grammatical items enable us to pay almost no conscious attention to the construction of our own sentences, or to the deciphering of the sentences of others, while allowing us to devote ourselves entirely to the content of what we say and hear. We do not have to be continually peering for road signs and cutoffs to find out where we're going, or who did what to whom. The broad highway of grammaticization grabs us and takes us effortlessly where we want to go.

We will return to the structural-functional side of grammatical items in the section on syntax. It is not their only side, however, for though they may never have referents to which you could point, they are by no means devoid of meaning. They constitute, as it were, the coordinates of the linguistic map, a kind of topological grid whereby the positions of objects and events can be plotted relative to the observer and to one another.

This relativity is a critical attribute of grammatical items, as it is of adjectives. Just as *small* is always relative to the category under discussion, rather than to absolute size, so items like *up* or *down* are used without any reference to absolute distance. You can go *up the tree* or *up Mount Everest*, and there is no implication in either case that you completed the ascent. Even if you have only ascended to the second or third tier of branches you have gone *up the tree*, and the sentence *He went up Everest but couldn't make it to the top* is in no way contradictory. Moreover, there is no word *flup* such that *I went flup the mountain* would mean, say, 'I ascended the mountain to a height of five hundred feet'. Similarly there are no tenses that would differentiate between, say, past events that happened within your lifetime and past events that happened before you were born. The same past tense is used for things that happened seconds ago and things that happened billions of years in the past.

The relations that grammatical items can express include relative location (*above, below, in, on, at, by, next to*), relative time (*before, after, while*, and the various indicators of tense), relative number (*many, few, some*, the *-s* of plurality), relative direction (*to, from, through, left, right, up, down*), relative familiarity (*the* for things the speaker thinks the hearer will recognize, *a* for things the speaker thinks the hearer won't recognize), relative possibility (*can, may, might*) and relative contingency (*unless, although, until, because*), as well as a variety of relationships such as possession (*of*, possessive *-s, have*), agency (*by*), purpose (*for*), necessity (*must, have to*), obligation (*should, ought to*), existence (*be*), nonexistence (*no, none, not*), and so on and so forth.

Only relations found in English have been listed here. Other lan-

languages may not always express all those relations, or may express ones that English does not. For instance, languages as diverse as Turkish and Hopi have verbal inflections that indicate whether a statement is based on personal experience or on information obtained at second hand. But by no means every relation in the real world can be grammaticized.

Indeed, what is remarkable is that the list of grammaticizable relations is so short, especially when you consider that the number of possible qualities and relations in the world is certainly immense and perhaps infinite. Why do languages grammaticize a few of these relations quite consistently, but never grammaticize the vast majority of them?

One guess might be that what languages grammaticized were the things that had proved most useful to us in evolution. If this is correct, it is far from being obviously so. If it were, we might expect to find at least some language that attached to every noun a grammatical item indicating whether the thing it referred to was edible or not, hostile to humans or not, or some other quality of a similar nature. Yet apparently no such languages exist.

There seems no obvious reason why distinctions like one/more-than-one or past/nonpast should have played a more important role in our evolution than distinctions like edible/inedible or hostile/friendly. For reasons not yet understood, language forces us to express *automatically* a very restricted subset of all the possible qualities and relations in the world. If we want to express others, we can of course do so. If we want to say that something is friendly, or edible, or whatever, we can, but that will take up a whole sentence. We can't build these things into the very structure of our discourse, as with tense, plurality, and so on: we are obliged to do.

It is worth noting, too, the extent to which limitations on what can be grammaticized affect the way in which language represents the world. It is even possible to think of cases where it might seem highly advantageous to have a grammatical item that doesn't actually exist—one that would express the relation between wholes and parts, for instance.

Take an expression like *a tree has leaves*. In passing we may observe the oddness of this verb *have*, which can appear in a wide variety of contexts, and express a variety of very different relations: *You have a cold*, *Mary has a sick grandmother*, *Bill has a good job*, *Who has the exact time?* and so on. All of these at least share the feature that if you were to take away your cold, Mary's grandmother, or Bill's job, you, Bill, and Mary would still be there intact. But in addition to a *tree has leaves*, we can say *a tree has branches*, *a tree has roots*, *a tree has a trunk*, *a tree has bark*. Take away all the things that a tree 'has', and there is no tree left to 'have' them.

It might be extremely convenient if a language could express the relations that exist between wholes and parts by means of grammaticization, rather than by recruiting unsuitable lexical items like *have*. One might then substitute grammatical items like *inc*, meaning 'including as part of itself', or *onc*, 'forming a part of'. This would allow us to say things like *a tree inc leaves* (instead of *a tree has leaves*) or *leaves onc a tree* (instead of *leaves of a tree*; *of* is as bad as *have* in this context, since if you take away everything that is *Of* the tree, once again you have no tree left). But no language yet discovered does things this way. When it comes to lexical items, we can invent as many new ones as we want or need, but we cannot add to the store of grammatical items. We are stuck with the ones we've got, so that we have to stretch concepts that *are* grammaticizable, like 'possession' with its *ofs* and *haves*, in order to express even something as basic as the part-whole relationship.

You may dismiss such things as mere 'conventions of language'. But conventions are made and can be broken. Things like our ways of expressing the relation between a thing and its parts are quite automatic and cannot be altered, replaced, or even added to. Lexical items are open-ended and can always be added to, but grammatical items constitute closed sets. It is as if nature has provided us with a black box containing a machine that enables us to orient ourselves in the semi-simulacrum of the real world that language-as-representation creates. But the box is sealed; we can neither alter it nor (so far) explain it.

SYNTAX

Having looked, all too briefly, at predicability and grammaticization, we must now turn to the third and most formidable pillar of language structure, syntax. The reader is warned that without some previous exposure to linguistic argumentation, much of the remainder of this chapter will be heavy going. There is however no alternative. As will become apparent in the chapters that follow, syntax, rather than referential meaning, may be what most decisively separates us from other species. If this is so, then we can hardly hope to understand what is most remarkable about our nature if we do not have at least some understanding of what syntax is and how it works.

Try to rearrange any ordinary sentence consisting of ten words. There are, in principle, exactly 3,628,800 ways in which you could do this, but for the first sentence in this paragraph only one of them gives a correct and meaningful result. That means 3,628,799 of them are ungrammatical. How did we learn this? Certainly no parent or teacher ever told us. The only way in which we can know it is by possessing, as it were,

some recipe for how to construct sentences, a recipe so complex and exhaustive that it automatically rules out all 3,628,799 wrong ways of putting together a ten word sentence and allows only the right one. But since such a recipe must apply to all sentences, not just the example given, that recipe will, for every language, rule out more ungrammatical sentences than there are atoms in the cosmos—and there are at least five thousand different languages!

What kind of handbook of itineraries could allow us to pick our way across the atlas of language in so delicate a fashion, avoiding so many possibilities, selecting so few, and yet doing all of this so automatically that we are aware only of the mote we can say, and not of the mountain we cannot?

Constraints on predicability and grammaticization are only a part, probably the smallest part, of the story. The part of the sentence machine that enables us to make an infinite number of new meanings out of combinations of words is itself quite meaningless, a purely formal structure. Moreover, for all its complexity, we acquire that structure without the least conscious effort. More surprisingly still, we learn it, to all intents and purposes, without making mistakes. For of all the apparent 'mistakes' a child may make in learning English, there is hardly one that would not be correct in some other language. The following brief account of this syntactic machine will stick fairly closely to the descriptive model currently being developed by Noam Chomsky and his associates—a model that differs in some radical respects from his earlier work.

Let's start with the shortest possible kind of declarative sentence, such as *Fred left* or *Night fell*. We saw in chapter 2 that some force, perhaps the way concepts developed in antecedent species, resulted in a distinction between entities and the behaviors (actions, states, processes) that can be predicated of these entities. Thus the prototypical sentence consists of an entity and a behavior, or rather of the labels for the concepts of these. These two kinds of label are termed, respectively, 'noun' and 'verb', and they are perhaps the most basic building blocks of language, from which everything else is somehow or other derived.

Some readers may recall the old definition 'a noun is the name of a person, place, or thing'. This is obviously wrong, since there are nouns like *absence* or *nonexistence*. Moreover, nouns are not names (although a name is a kind of noun). *Cow* is neither the name of any particular cow, nor the name of all cows. We might better define a noun as something of which something can be predicated. If you can predicate of absence that it makes the heart grow fonder or of nonexistence that it constitutes the goal of some Eastern religions, then *absence* and *nonexistence* are nouns,

whether or not they denote anything. If nouns and verbs are the most basic elements of syntax, then predication is its most basic act.

For *Fred* or *night* we can substitute pronouns, we can say *he left* or *it fell*. If we couldn't, we would be forced to say things like *The young boy told the older sister of the young boy that the young boy didn't know what the older sister of the young boy wanted for the older sister of the young boy's birthday*. It is much quicker and easier to say *He told her that he didn't know what she wanted for her birthday*, provided of course that we can reliably identify *he*, *she*, and *her* (more about that in a moment).

Notice however that we can't say things like *the young he left* or *his heavier it fell*. From our examples so far one might conclude that pronouns replace nouns, but in fact they replace noun phrases: *he* replaces *the young boy*, not just *boy*. The fact that you can replace *Fred* by *he* in *Fred left* but that you can't replace *boy* by *he* in *the young boy left* shows us that even where we see only a bare noun, like *Fred* or *night*, there is really a full noun phrase present—the phrase just doesn't happen to contain any elements other than the noun.

In fact, pronouns replace not merely noun phrases, but the largest available noun phrase. If they replaced just any noun phrase, it would be quite normal to replace *Bill and Mary left* with *he and she left*. In fact, this sounds very odd; we naturally say *they left*. *Bill and Mary* constitutes a kind of super-noun-phrase that contains two other noun phrases.

Of course noun phrases like *Fred* and *night* can be expanded to form larger phrases like *The Fred you were talking about* or *any night in the next few weeks*. Here, the noun may be preceded by a specifier, a grammatical item like *the* or *any*, and followed by a complement, a clause or another phrase of some kind. Nouns and verbs may be the most basic building blocks of language, but the most important are phrases. If we know how to construct phrases, and how to join phrases to one another, we know most of what we need to know in order to construct sentences.

PHRASE STRUCTURE

But *how* do we know how to construct phrases? Because we have—somehow—a kind of template or model of what a phrase must be like. Not just a noun phrase: any kind of phrase. For the remarkable thing is that phrases of all kinds, including whole sentences (for a sentence turns out to be just a big phrase with lesser phrases in it), are constructed in the same way. A phrase consists of three parts or levels. The most critical part, the only part that can be there on its own, is the head. The head of a phrase cannot be larger than a single word and that word must be—

long to the same class as the phrase. Noun phrases have nouns as their heads, verb phrases have verbs, and other types of phrase (adjective phrases, prepositional phrases, and so on) follow the same pattern.

A head is first linked to its complement. For example, in the noun phrase *the cow with a crumpled horn*, *cow* is first linked to *with a crumpled horn*, and the node that joins them is specified as N' . N' is simply the level of structure intermediate between that of the head noun, the N level, and that of the full phrase N'' (see Figure 3.2). Note that while a head cannot itself be a phrase, a complement may consist of a phrase or even several phrases embedded in one another (here, *with a crumpled horn* is a prepositional phrase, which in turn contains another noun phrase, *a crumpled horn*).

This embedding is possible because phrases are not, as they might appear to be, strung together serially, like beads on a string. Phrases are like Chinese boxes, stacked one inside another. The importance of this point can hardly be overestimated. Many people concerned with the origins of human language, or with the alleged language capacities of non-human species, have been led to propose grossly simplistic hypotheses about how language could have emerged, simply on the basis of a mistaken assumption. They assume that words are serially chained into phrases and phrases into sentences in pretty much the same way that steps are chained into walking, or (in a slightly more complex fashion) the same way that a variety of motor functions are chained into a series of actions—for instance: grasping, raising, drinking from, and then lowering a cup. Nothing could be further from the truth.

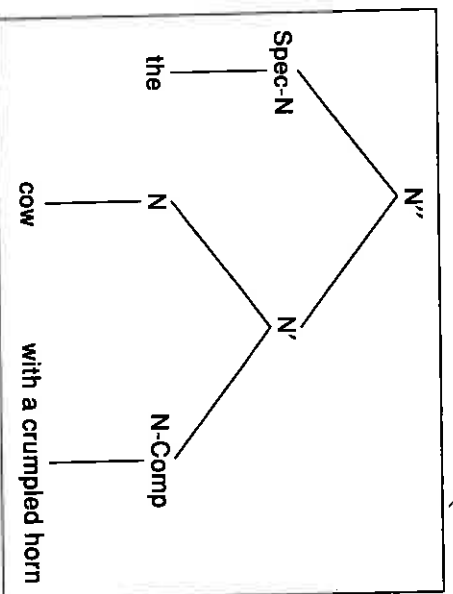


FIG. 3.2. Basic noun phrase structure

This can be seen by considering a phrase like *the cow with the crumpled horn that Farmer Giles likes*. Although no single word in this phrase is ambiguous, the phrase as a whole is, because we do not know whether it is the horn or the cow that Farmer Giles likes. The ambiguity is purely structural, due to the fact that the clause *that Farmer Giles likes* can be attached in either of two places. If it is the horn he likes, then the clause is a complement of *horn*. If it is the cow, the clause is a complement of *cow*, not *horn*, even if, in utterance, it comes directly after *horn* rather than directly after *cow*.

This is possible because a head may have more than one complement. It would be possible to take the idea of 'level' with dead literalness and branch all complements of N from a single N' node, as in figure 3.3a. However, there are strong reasons for supposing that no more than two branches can spring from a single node, so that the structure of the phrase is better represented by figure 3.3b. In other words, the N' level simply represents an abstract level intermediate between the noun and the full phrase. Normally a head will have only a single complement, but if there is some other element that meets somewhat strict conditions for serving as complement of that particular head, then the abstract X' level may be represented by more than one literal level.

Finally, we complete the phrase by linking the highest N' to the specifier, *the*, as in figure 3.2. The overall pattern of that figure can be repeated for any other kind of phrase, and constitutes, so to speak, the very core of universal syntax (figure 3.4).

X in Figure 3.4 stands for any lexical category (noun, verb, adjective, preposition, etc.) that can be expanded to form a phrase. The n in parentheses after X' indicates that this level, unlike X'' and X , can be repeated, provided that there is more than one complement that genuinely can pertain to X . The parentheses around Spec and Comp indicate that these items are not obligatory, although everything else is. The horizontal two-headed arrows indicate that the relative positions of Spec and X' , and of X and Comp, can be exchanged.

Contrary, again, to the idea that language is some kind of serial stringing process, syntactic principles have nothing at all to say about the order things come in, except insofar as this is determined by their hierarchical positions relative to one another. (As figure 3.3b suggests, the serial order of words can be determined by starting from the top left-hand side of a tree and then working down it to the bottom and up again to the top right-hand side.) In other words, X-bar theory (the theory of phrase structure briefly sketched above) specifies vertical, but not horizontal, relations.

It is partly because general principles fail to determine word order that the syntaxes of the world's languages look as diverse as they do. Languages fully exploit the possibilities of variation permitted by the schema shown in figure 3.4 (as well as certain movement possibilities to be discussed below). Thus in many languages one finds verbs preceding their subjects, or following their objects; adjectives and relative clauses

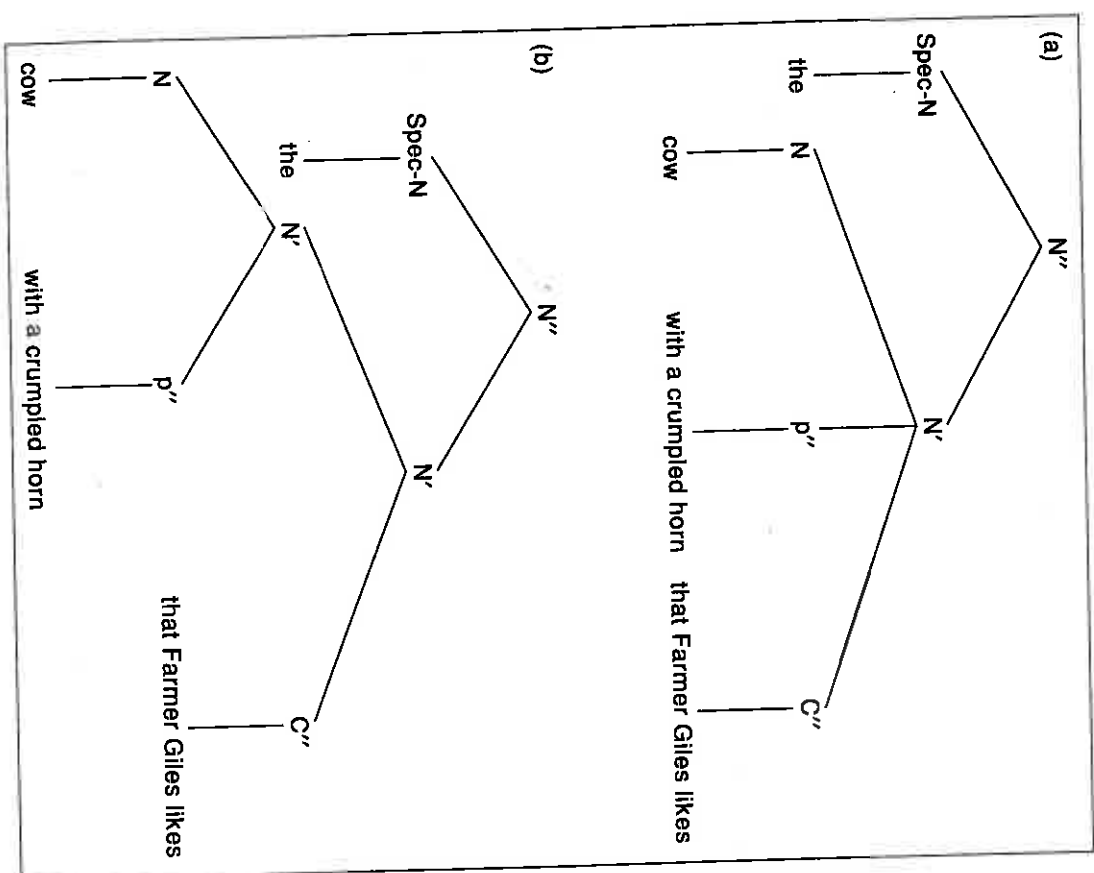


FIG. 3.3. Nonbinary versus binary branching

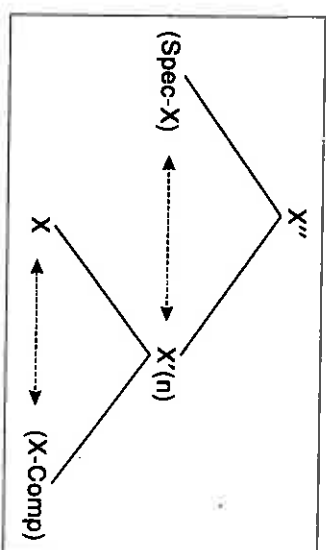


FIG. 3.4. Universal phrase structure

'in the wrong order' with respect to the nouns they modify; and so on. This is a daunting experience for the learner, and one that has led some linguists to suppose that 'universal grammar' is an impossible dream. However, the regularities of figure 3.4 underly all this superficial variety.

As noted in that figure, specifiers and complements are optional, but heads are obligatory. This is why single nouns that are the heads of noun phrases (NP-heads) can occur in isolation, like *might* in *Night fell*. But a specifier or complement can never appear without a head. You could say that a head is necessary in order to 'govern' its specifiers and complements.

However, sometimes nothing actually appears in a place where you would expect to find at least a head. Compare *I expected Bill to leave* with *I expected to leave*. In the second sentence there is no word that corresponds to *Bill* in the first, yet somehow we know that it is I myself, not Bill or Mary or people in general, who was expected to do the leaving. Should we assume that there's nothing there, or that there was something there that has been taken out?

Compare *I called Bill* with *I asked him about it* with *I told Bill* with *I asked him about it*, where *e* indicates the positions of null (not overtly expressed) noun phrases in both cases (someone, some subject must be doing the asking). These sentences look at first sight as if they are identical in meaning and structure except for the choice of verb. But this cannot be so, for in the first sentence, *him* can refer to Bill and would normally be taken as doing so, whereas in the second, *him* cannot possibly refer to Bill. And if we look a little closer, we will see that we have to make different assumptions about *e* in each case. In the first sentence, it refers to *I* and in the second it refers to *Bill*. Now a genuine 'nothing' can't have two different references, nor could it change the reference of *him*. We

can therefore conclude that there must be 'something' there. For in language, as in physics, there are things that aren't perceptible to our senses but that are known to be present because of their differing effects.

Let us turn now to structures larger than the single phrase. It was noted above that all language is phrasal in structure, but, on the face of things, this remark may seem odd. What about our very first and simplest example, *Fred left*? *Fred*, though appearing on the surface to be a single noun, has been shown, by the 'pronoun replaceability' test, to be in reality an N' structure, a full noun phrase. In a similar way, it might be assumed that *left* is the head and only constituent of a V' or verb phrase. But what then becomes of the statement that phrases are always inside phrases, like Chinese boxes? Here we seem to have a noun phrase and a verb phrase, enough to give us a complete sentence, with nothing left over. How can these statements be reconciled?

Contrary to appearances, *Fred left* does contain 'something left over': an additional element that has not yet been noted. The head of V' is not really *left*. The verb is *leave*; *left* is simply *leave* + past tense. Recall Quine's bewilderment at the fact that every sentence had to have tense. Now we can see why this is so, and at the same time we can appreciate the two-faced nature of grammatical items: on one side, they are conveyers of meaning, on the other, indispensable parts of syntactic structure.

Tense constitutes part of the inflectional system of verbs. Another part, one not very apparent in English but much more so in a language like Spanish, is agreement, usually agreement of the verb with the subject of the sentence. Agreement and tense are not parts of either the noun phrase *Fred* or the verb phrase *leave*. Tense sometimes attaches to the verb, but it has scope over the whole sentence, not just the predicate. For instance, if, in the sentences *His wife left him* and *His wife is leaving him*, *him* has the same referent, then the sentences can only be about a man who has had (at least) two wives; *his wife* will have two distinct referents and only tense (past versus present) will indicate which one is referred to in each case. Agreement may be determined by properties of the subject ('male', 'plural', or whatever) but it, too, often attaches to the verb, and may be regarded as what ties subject and predicate together.

If tense/agreement is neither a specifier nor a complement of anything, it can only constitute a head. If we assume that it does then a simple subject-predicate sentence falls into exactly the same pattern as do all other phrases. Since tense and agreement are generally inflections, call that head INFL or I for short. Then the subject noun phrase is

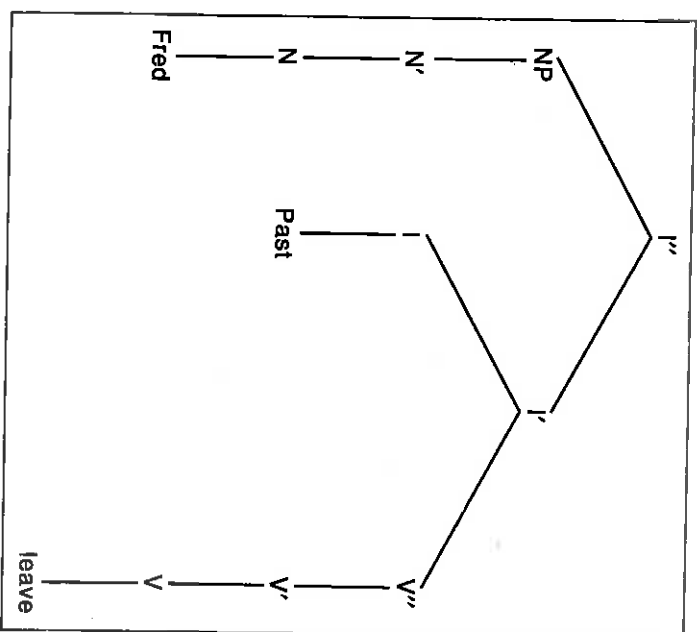


FIG. 3.5. Structure of *Fred left*

the specifier of I, while the verb phrase is its complement. (A predicate like *left immediately* is quite indeterminate unless you specify *who left*.) A sentence, then, is simply I'.

It follows that the full structure of *Fred left* is that shown in figure 3.5. Note that this figure follows exactly the model of figure 3.4. But because in *Fred left* INFL is less than a word, it cannot remain in its original position, but must attach itself to the nearest word of a similar class, a verb. You may ask how we know that the original position of INFL is between subject and predicate when INFL usually attaches to the ends rather than the beginnings of verbs (*they parted*, *Bill snored*). The answer is that if INFL is attached to some special word of its own, it can and does stay in place, witness *Fred DID leave*!

ARGUMENT STRUCTURE

But most sentences are longer and more complex than *Fred left*, and one variable that affects the complexity and length of a sentence is the number of entities that it makes reference to. (*Fred leaves*, of course, men-

tions only one.) That variable depends to a large extent on the verb chosen, for each verb subcategorizes for (more or less obligatorily selected) a fixed number of 'arguments', each of which will be an 'N' or sometimes a 'P' or even a whole clause ('?'). By an argument of a verb is meant simply a phrase referring to any participant involved in or directly related to the action, state, or event that the verb expresses.

Thus *arrive*, *sleep*, *fall*, *expire*, and *trickle* take only one obligatory argument; *beat*, *trap*, *drop*, *inspire*, and *tickle* take two; and *give*, *order*, *promise*, *bring*, and *tell* take three. We cannot say *I arrived him* any more than we can say *I beat*. Note that *to leave* in *I ordered him to leave* is just as much an argument of *order* as is *him*—you cannot just say *I ordered him*, although of course there is another verb *order* (as in *they ordered steak*) that takes only two arguments. As will be apparent, there are cases where even subcategorized arguments can be omitted, or rather, may be null elements with unspecified reference: *they sang*, *we ate*, *he drinks*. However, if we say *she likes to tickle*, no one would take this to mean 'she likes to tickle doorknobs, ferns, kitchen equipment, etc.', but only 'she likes to tickle entities that can respond to being tickled'. In the same way, *they sang* means 'they sang songs', *we ate* means 'we ate food', and so on.

In addition to subcategorized arguments, there may be optional arguments relating to time (*on Thursday next*), place (*right outside the door*), instrument (*with a hammer*), and a few other members of a very limited set. As this suggests, arguments are not chosen arbitrarily. We can, if we like, conceive of a sentence, notionally, as being like a little play or story, one in which each of the characters has a specific role to perform. There is a finite and indeed very short list of these roles. Not all linguists are agreed as to exactly what they are, but most, if not all, would include the roles of Agent (*JOHN cooked dinner*), Patient or Theme (*John cooked DINNER*), Goal (*I gave it TO MARY*), Source (*I bought it FROM FRED*), Instrument (*Bill cut it WITH A KNIFE*), and Beneficiary (*I bought it FOR YOU*), as well as Time and Place.

Again, note that the function of grammatical particles is a double one involving both meaning and structure. The 'meaning' function is that the grammatical item shows us what is the thematic role of each argument: *to* indicates a Goal, *from* a Source, *with* an Instrument, and so on. The 'structure' function is to govern arguments that cannot be governed by the verb, and we will return to this shortly.

What has been very briefly sketched above is something called 'argument structure'. One remarkable thing about argument structure is its universality. When we learn a foreign language, initially we make all kinds of mistakes; we assume that structures in the target language re-

semble structures in our own, or that the semantic ranges of its words are identical with those of words in our language, or that its tense system relates to time in the same way that ours does. In practically every department of language we are confronted by pitfalls such as these. In only one area do we never make mistakes, indeed our success is so complete we probably never realize how effortlessly we are 'learning'.

That area is argument structure. If a foreign language has a verb that means 'sleep', we can be sure it will have only one obligatory argument. If it has a verb that means 'beat', that verb will have two, and if it has a verb that means 'give', that verb will have three. Moreover, the roles of those arguments will in every case be the roles that English verbs assign.

Argument structure, then, is universal. It is a form of structure that runs parallel with, yet separate from, the phrase structure discussed in the previous section. In order for sentences to be made, one kind of structure has to be mapped onto the other. A systematic mapping is necessary because if we are to correctly arrive at the meaning of a sentence, we have to be able to determine, automatically and quite unambiguously, 'who did what, and with which, and to whom'. That is, since not all thematic roles carry distinguishing prepositions, we may have to be able to determine the thematic role of an argument from the structural position of that argument in the sentence.

An example will make this mapping process clearer. Most verbs, as shown above, regularly take one, two, or three arguments. However, there are some verbs, like *melt*, *boil*, *sink* and so on, that sometimes take one argument and sometimes two. Whether one or two are present, there is always a Patient, but the position of the Patient is not always the same. If there are two arguments, then the Patient will follow the verb (*Mary melted the ice*, *The Navy sank the ship*, and so on). If there is only one, the Patient precedes the verb (*The ice melted*, *The ship sank*).

The reason for this is that argument structure is mapped onto phrase structure according to a hierarchy of thematic roles. This hierarchy is roughly as shown in figure 3.6. Usually only the roles above the line in that figure are subcategorized for, although there are one or two exceptions (*put*, for instance, subcategorizes for location, so that we can say *put the dish on the table* but not simply *put the dish*). Mapping onto phrase structure proceeds by putting the highest available role in the highest position (Spec-I, the position of *Fred* in figure 3.5). If the verb subcategorizes for an Agent role, Agent will be highest, and either Patient or Goal will take the next highest position (often, though not always, these two can commute, as in *give John money* versus *give money to John*). Any remaining roles will take still lower positions.

This process is not without exception. Occasionally a nonsubcate-

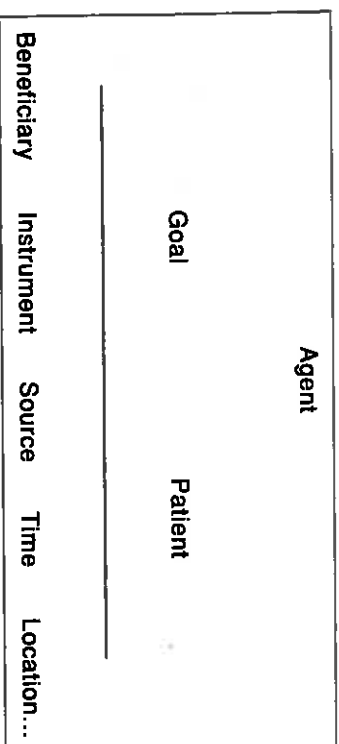


FIG. 3.6. Hierarchy of thematic roles

gorized role can be found higher than a subcategorized one. For example, one can say *a key will open the door* (where *key* is an Instrument) alongside *the door will open with a key*. Also, what has been said applies only to active verbs. If the verb is passive, the highest role, Agent, can never appear in the highest position, although it may optionally appear in a lower position as part of a *by* phrase. But in active sentences there are no cases where a lower thematic role *obligatorily* takes a higher position than a higher thematic role. That is, there will always be an alternative that obeys the hierarchy (for example, *the door will open with a key*) and in most cases the form that obeys the hierarchy will be the only form.

It was noted just now that prepositions such as *for*, *to*, and so on perform two kinds of role. The first role is that of determining an argument's thematic role, the second a more purely structural one. Recall that in discussing phrase structure a head was said to govern its complements. Part of what we mean by this is that arguments cannot simply wander around loose in a sentence. Every argument has to be governed by something, which is just another way of saying, every argument has to be within some X", and every X" has to have a head.

But every argument cannot be governed directly by V, because a verb cannot take an unlimited string of complements. For one thing, we would have a lot of trouble in processing things like *wrote letters Mary Bill his computer his study might* (at least, a lot more than we would have in processing *wrote letters to Mary for Bill on his computer in his study at night*). For another, a verb can only give thematic roles to the arguments it subcategorizes for, in other words those we can expect if we simply know the verb's meaning. So prepositions are necessary (in English—in other languages their function might be performed by postpositions, or

other types of particle) not only to assign thematic roles, but also to head up a new X" structure within which they, as heads, can govern the argument and also give it case.

The idea of case has had a checkered career in syntax. At first, English was said to have case because Latin had case and all good languages ought to be like Latin. Then it was observed that (outside of pronouns) there are no overt signs of case in English, so it was claimed that case was nonexistent in English. Later still, fairly recently in fact, when a universal grammar no longer based on Latin began to seem not only possible but real, case came back. Take a simple sentence like *Mary met the girl*. Neither *Mary* nor *the girl* has any overt marking of case. But if you replace these by pronouns, you have to say *she* (nominative) *met her* (accusative). You can't say *her met she*, *she met she*, or *her met her*. If, when you replace a noun phrase by a pronoun, that pronoun automatically gets case-marked, this suggests that the noun phrase, too, must have been receiving case even if no overt case-marking was visible.

Also, if case was only a fiction, it is rather odd that one could specify exactly the conditions under which that fiction would be assigned: direct adjacency of case-marked argument and case-assigning constituent, and only one case to be assigned by each assigner. Granted, there is one apparent exception to this, which no one has yet satisfactorily explained—double-object constructions like *gave him change*, where both *him* and *change* seem to get case from the verb—but it is the only one. Whatever the process is, it doesn't extend to overtly case-marked items, at least not in American English. *Give him it* is unacceptable, we have to say *give it to him*.

The need for nouns to get case explains a lot of puzzling things about language. It explains, for instance, the mysterious *of* in the sentence *Take any sentence that you might think of*, discussed earlier in the chapter, which seemed totally meaningless. So it is; it is there simply because *think* does not subcategorize for N", but only for a clause (*They think it's time to leave*). Otherwise, it is intransitive (*I think, therefore, I am*), or it is a question of *thinking thoughts*. (Since there is nothing that can be the object of *think* except *thoughts*, the latter counts as an idiom, and therefore falls outside syntactic theory proper.)

Think must be able to govern a complement, otherwise it could not govern *it's time to leave* in *They think it's time to leave*. But complements that are clauses don't require case, so the reason that *think* can't have a noun phrase as its complement may be that it can't assign case to it. (This has something to do with the fact that it doesn't subcategorize for a

noun phrase complement, but which is cause and which effect isn't entirely clear.) *Think*, therefore, has to be followed by some grammatical item that will assign case. *Of* happens to be chosen for the job nowadays, but *about* may be used too, with slight or sometimes nonexistent differences in meaning. At an earlier stage of English, *on* could be chosen (*Think on these things*). What is chosen, and what that something means, is secondary to getting the purely formal work done.

But of is generally chosen when verbs are turned into nouns. If we say *Columbus discovered America* we don't need an *of* before *America*—indeed, if we say *Columbus discovered of America*, the sentence is bad. And yet we can't talk about *Columbus's discovery America*, only about *Columbus's discovery Of America*, of being essential in this context. But what does *of* add to the meaning? Nothing at all. It is there simply to give *America* accusative case. *Discover*, unlike *think*, can give case to a noun phrase complement, but nouns, even nouns formed from verbs, can't do this.

If something didn't give *America* accusative case, the case that verbs normally give to their objects, we wouldn't *automatically* know that *America* is still related to *discovery* in exactly the same way as it was related to *discover* in *Columbus discovered America*. That is, we would not know that *America* is still a complement and Patient argument of a deverbalized noun. Without *of*, we wouldn't *automatically* be able to distinguish the sequence of *Columbus, discovery*, and *America* from the same sequence in, say, *Since Columbus's discovery America has never been the same*, where *America* and *discovery* are totally disconnected from one another.

In other words, case and government function (among other ways) as backup systems for processing and interpreting the products of the argument-structure/phrase-structure system. Their principled predictability makes it possible for us to interpret sentences quite automatically, without paying any conscious attention whatsoever to HOW things are said, freeing us to devote all of our consciousness to WHAT is said. Case and government achieve this result by acting, so to speak, as a kind of glue that sticks sentences together, ensuring that everything has a place and is in that place, or at least can be related to that place.

MOVING AND KEEPING TRACK OF THINGS

If the system described so far were the whole of language, language would be a very unresponsive instrument, rigid and restrictive. With trivial exceptions, we would not be free to move words around in our

sentences so as to emphasize certain things while de-emphasizing others, nor to direct our hearers' attention to the exact shades of meaning we wished to express. We need that freedom, but we have it at the risk that, if movement is unprincipled, we may no longer be able to reconstruct meaning, to determine 'who did what to whom'. If things are to move, we must be able to keep track of them, to see where they have moved from.

The actual status of 'movement' is still controversial. There are those who hold that, in sentences like *What did you see e?*, *what* really did move from the position marked by *e*. *What* is, after all, the direct object of *see*, it bears the thematic role of Patient normally assigned to things at the position of *e*, and indeed the position of *e* is actually occupied by *what* in the question expressing surprise, *You saw WHAT?* Others hold that there is no such thing as movement. Things are where they are, they would say, although mechanisms will still be required to link certain elements, like *what* in *What did you see?*, to certain empty positions, so that they can be interpreted automatically.

For, regardless of whether we hypothesize movement or not, we have to have some way of explaining how we know, for instance, that a sentence like *How do you know who he saw?* is a possible question, but not a question about how someone saw someone or who you know, while *Who do you know how he saw?* is not a possible question at all, even though there would be a perfectly logical and possible answer for it (*I know he saw Bill by looking through a telescope, but I've no idea how he saw Fred*).

Chomsky has suggested that these two approaches, 'movement' versus 'nomovement', may turn out to be merely notational variants of one another, and the issue is certainly not worth the paper that has been used in arguing about it. Perhaps it is best to think of movement as a convenient metaphor to help us grasp processes that are still far from being thoroughly understood. The importance of movement may lie in helping us to realize that, with almost every second sentence we utter, we deal, blithely unaware, with at least two kinds of 'nothing'. If someone says *What did you tell me to do?* there is a nothing that represents a gap that something has been moved from, and a nothing that represents something that is definitely still there. In other words, in the sentence *What did you tell me e₁ to do e₂? e₂* marks the space from which *what* has moved (or, to which it must be related), and *e₁* the space where an invisible first-person pronoun still sits, because it's 'I' not 'you' who is expected to do something.

But to distinguish one kind of null element from another is not enough. We need some way of finding how far we have to look, from a

space left by movement, in order to locate the thing that moved from it. Moreover, since this looking has to be as automatic and unconscious as breathing, that way has to be both highly specific and infallible. The way is also quite complex, but in brief, things can move quite a long way if they can hop, so to speak, from one space to another.

Take a sentence like *Bill heard that Mary said that John knew what Fred did e*, where *e* marks the place that *what* moved from. You can also say, *Bill heard that Mary said what John knew e that Fred did e*, or *Bill heard what Mary said e that John knew e that Fred did e*. This is possible because, for each *I'*, each cluster consisting of a verb and its arguments, there is usually (not always) an additional phrase, a kind of superphrase that includes *I'* as its complement. Since in many cases such a phrase is headed by an overt complementizer (a grammatical item like *that* which introduces a clause), we call this *C'* (see figure 3.3), and the space to which things move is actually the specifier of *C'*. When there is a chain of such positions, as in the *Bill heard* . . . sentence, things can hop from one position to the next.

The reason we can't have *Who do you know how he saw e?* is if *who* moves from the position marked by *e*, it has to pass through the space already occupied by *how*. *Who* can't simply jump over it, because the boundaries of phrases, the *N*'s and *V*'s and *C*'s, act as barriers to prevent things from getting 'too far from home', so to speak. If something 'got too far', you could no longer know *for sure*, and *automatically and unconsciously*, where it came from. So movement, even when it seems to go a long way, is really a very local phenomenon.

You could also say that it has in some sense to be an 'expectable' phenomenon. Things can really only move either out of simple one-clause sentences, as in *What did you see?*, or out of clauses that are subcategorized complements of some verb, as in the *Bill heard* . . . sentence just discussed. That is to say, you can move something into the next highest clause, if the clause where it originates has to be there. But other kinds of clause, such as relative clauses, adjunct clauses, and coordinate clauses, don't have to be there. A subcategorized clause is one that the sentence would be incomplete without; these other kinds can be omitted at will and still leave a complete sentence.

It follows that if the clause is a relative clause, you can't extract a question-word from it. You can say *We know the boy who comes from Texas*, or *Who do we know?*, or even *Where does the boy who we know come from?*, but not *Where do we know the boy who comes from?* If the clause is an adjunct, you can't extract a question-word from it. You can

say *John read the paper while waiting for the bus* or *When did John read the paper?* or *What was John waiting for while he read the paper?*, but not *What did John read the paper while waiting for?* If the clause is coordinate with another clause, you can't extract a question-word from it. You can say *Mary washed the dog and John cooked spaghetti*, but you can't say either *What did Mary wash the dog and John cook spaghetti?* or *What did Mary wash the dog and John cook?*

Now none of these facts are facts that we were ever taught by teachers or by parents. Nor are they things that are dictated by logical necessity, or social convention, or any language-external factor that we might think of. It should be apparent that we are in the presence, not merely of a system that determines what we can and cannot say, but of a system wholly below the level of consciousness that cannot have been acquired through instruction, induction, or any of the other recognized processes by which learning takes place.

THE NECESSITY OF SYNTAX

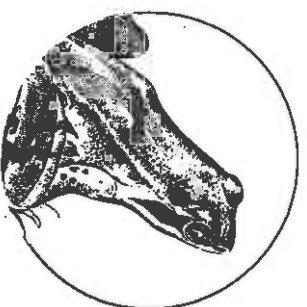
The reader who is not accustomed to thinking about language from a purely formal viewpoint may find the whole system of syntax, as described above, excessively abstract and complex. In fact, such readers should feel relieved rather than put-upon, since this account has been drastically shortened and simplified (oversimplified, in some cases) for reasons of space and ease of exposition. Furthermore, again for ease of exposition, this account has dealt with only one language, English. Although the principles described are universal, and have been shown to be operative in a wide range of languages, some of which are very different from English, the fact that other languages include different types of grammatical item (clitics, noun classifiers, switch-reference particles, topic markers, and so forth) as well as different processes (scrambling, ergativity, verb serialization, and so on) means that these principles will inevitably be expressed in different ways.

Language seems simple and transparent to its users because its processes are quite automatic and unconscious. There is, perhaps, a tendency to believe that automatic and unconscious operations are associated with 'lower' faculties (breathing, digestion, circulation of the blood) while 'higher' faculties ought, simply by virtue of being 'higher', to be somehow within the reach of introspection. If we can't introspect them, we may think, they can't be there. For this reason, many people, including even some linguists, continue to suppose that the complexities of syntax represent some kind of arcane chop-logic indulged in by a

handful of ivory-tower grammarians, or the superficial top-dressing of some literary 'high' language remote from the ways in which ordinary people speak.

In fact, the more closely you examine syntax, the more complex you find it to be and the more widely its complexities show up, even in the allegedly 'simple' speech of everyday usage. For instance, all of the crucial examples in this chapter are sentences such as might be heard in any casual conversation. Yet all of the complexities described here, and more besides, were essential if our species was to achieve a communicative system with the power that language has.

A rich and subtly-layered vocabulary, such as we saw in chapter 2, might be sufficient to represent our environment and what we thought might be in that environment. But, if we were to be able to exchange those representations with one another, if we were to gain the vast increment in cognitive capacity that came from being able to manipulate and transmit our thoughts, and if we were to do all of this without having to spend an instant's reflection on the 'how' of it all, then the triple structuring derived from predicability, grammaticization, and syntax (the greatest of which is syntax) was essential. Indeed, no matter how rich the vocabulary, those thoughts could not even have been formed unless at the same time we had had some specific system for organizing them—precisely the system of formal properties described in this chapter. In later chapters, when we try to see how human language could have come into existence, it may become clearer *why* those formal properties were essential to it.



The Origins of Representational Systems

In chapter 1 we encountered what has seemed to many a paradox. On the one hand, language could not have evolved out of animal systems of communication. On the other, language must have evolved, since, for all its complexity, it is simply one of the countless adaptive mechanisms that have developed in species in the course of evolution. But we can escape from this paradox if we accept that language was first and foremost a system of representation. It was therefore, like all other such systems, a mechanism that to a large extent created its own output—rather than merely replicating, in another mode, what was fed into it. Precisely because of this, language was able to increase, by several orders of magnitude, not just the things but the *kinds* of thing that creatures could communicate about. No mere communicative mechanism could ever have done this.

Thus, if we are to seek for the ultimate origins of language, we cannot hope to find those origins by looking at the means by which other creatures communicate with one another. To find out how language, with all its complexities, evolved, it is necessary to look at how systems of representation evolved.

It should be made clear at this point exactly how the term 'representation' is being used. It has sometimes been used in psychology in an unduly narrow sense, to refer to fixed knowledge systems (whether derived innately, or from experience, or by interaction of experience and innate mechanisms). Of course fixed knowledge systems are representational systems, of which language is just one. But the most fleeting perceptions are equally representations. On the highest level of abstraction, at which we must work to get any sense of how creatures in general function in the