

**GEORGE A. MILLER**

**LANGUAGE  
AND SPEECH**

# Language and Speech

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p. 25 I. Tattersall and N. Eldredge, "Fact, theory, and fantasy in human paleontology," *American Scientist* 65, March 1977. Reprinted by permission of *American Scientist*, journal of Sigma Xi, The Scientific Research Society.

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## Preface

Time was when the study of language was the study of languages, when those who studied them were humanistic scholars and knowing the languages was less important than understanding the consequential texts that had been written in them. Such scholarship is still alive and well in the great centers of learning, but it is not the subject of this book.

Here we are concerned with a much younger discipline, the science of language, which grew in part from the humanistic study of languages, but which has many other roots. The modern science of language draws on the social and behavioral sciences—on anthropology and psychology especially—and on the preoccupation with symbolic systems that has characterized so much twentieth century philosophy. It also incorporates parts of the biological sciences—in particular those that contribute to a description of the neurophysiological mechanisms involved in producing and hearing speech, and those branches of comparative biology that enable us to compare linguistics with other systems of animal communication. And it has benefitted from the enormous growth of communication technologies, which have not only contributed essential instrumentation, but have provided a continuing source of practical applications and opportunities.

In an age when new branches of science are splitting off more rapidly than anyone can record, this convergence of many different fields in the science of language is a noteworthy exception. No doubt it reflects the importance of language, and the realization that it is too complex to understand from any single point of view. Language is everywhere, like the air we breathe, and serves a million human purposes.

All of which makes the science of language exciting work. There are certain problems, however, when one tries to share this excitement with others. The range of questions, the variety of methods, the diversity of presuppositions make selection essential, but how is one to find a door that opens onto the whole field? With so many different specializations, how can one convey the larger sense of a coherent, interrelated intellectual enterprise?

In this book I have taken the biological basis of human language as my narrative thread. Other threads could be chosen, but it seems to me that the true miracle of language is that such a thing as language actually exists. When you ask how such an improbability could occur, you are asking how it evolved, and that is a biological question. Unfortunately, we can never know exactly how it evolved, but the fact that evolution shaped humans into linguistic creatures is undeniable, and has important implications for almost every branch of the science of language.

A focus on the biological side of language thus provided a basis for selecting particular topics from a wide range of different approaches, yet imposed a common theme that I hope will suggest the underlying coherence of the field. How well this strategy has succeeded I must leave for the reader to judge.

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I would like to express my indebtedness to the many colleagues whose ideas and research I have appropriated in these pages, without explicit citations. Workers in the field will recognize the true sources; readers coming to the field for the first time will not be interested; readers who become interested can track the sources down from the Guide to Further Reading.

I also wish to express my gratitude to Katherine James Miller for assistance in every phase of preparing the manuscript for publication and to Donna Kwilosz Lyons for preparing the Index.

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January 1981

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# Language and Speech

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# 1

## Uniquely Human

Organic evolution has taken many strange turns. Who can say which was most surprising? Every living thing along its random walk was an incredible achievement in biological engineering.

Nonetheless, anthropocentric arrogance has always placed one fruit of evolution above all others, often so far above that it seemed a special gift to humankind from whatever gods we worshiped. Even scientists able to conceive of a cow as a biochemical machine have boggled at the incredible gift of language.

Why? Because the symbolic abilities that underlie human language made possible another mode of biological adaptation, one that is not transmitted genetically but supplements the genetically transmitted adaptations of organic evolution. The human capacity for language made human culture possible, and culture, with all its social, artistic, technological and scientific innovations, set *Homo sapiens* apart from all other animals. It enabled this big-brained, loudmouthed, featherless biped to overrun the earth—to understand and, through understanding, to control the adaptive process itself. Little wonder that the gift of language has so often been seen as nothing less than a divine miracle.

Max Black, a logician and philosopher at Cornell University, once commented that to insist on the importance of language is like battering at an open door. "But," he added, "there are times when it is necessary not to flinch from the obvious." The 20th century has certainly not flinched from



recognizing the importance of language. Ours has been an age of intense, almost morbid interest in language—in symbols, meaning, communication. In a time of growing apprehension that modern culture is headed for disaster, preoccupation with the human faculty that makes culture possible is not inappropriate.

Language can be studied from many points of view. The special responsibility of the scientific perspective is to say what language is, to describe it as a natural phenomenon and to explain its form and function. But anything as complicated as human language does not reveal its secrets easily, even to science.

Scientific progress has been most rapid in the study of speech, the tangible manifestation of language. This progress is attributable to the growth of communication technology and the consequent availability of acoustic, electronic, radiographic and computational instruments for analyzing and synthesizing speech signals. The science of linguistics has also flourished. Theoretical linguistics, borrowing conceptual tools sharpened by logicians for the analysis of symbolic systems, has emerged as one of the most rigorous of the social sciences; anthropological linguistics has now accumulated a sample of the world's languages broad enough to support serious analysis of their differences and similarities. Both speech science and linguistic theory have contributed to psychological studies of language and its implications for human perception, learning, thought and action. The scientific preoccupation with language has been both wide and deep.

But much is still not understood. At first each line of work went its own way, but as each sphere of knowledge enlarged, it became increasingly clear that certain common problems cut across disciplinary boundaries. Central to those shared concerns is the need to understand better the human faculty itself—to understand the biological foundations for the human capacities of speech, language and symbolic thought.

This book tries to explain how concern with the underlying capacity for language has arisen in different research contexts and what each approach has contributed to our

understanding of this uniquely human capacity. It is hoped that a reader will gain from these pages not only a glimpse of how the methods of science have been applied but also a deeper understanding of and respect for the incredible gift of language.

Let us begin by considering language as a form of knowledge and the human capacity for language as the capacity to acquire and use that kind of knowledge.

We say "Mary knows Russian" or "John knows English and French but not Japanese." What does it mean to know a language? What kind of knowledge is this?

In everyday speech, a person who is said to know a language is able to speak it, to be understood by others who speak it and to understand what they say in reply. Knowing a language is knowing how to use the language.

At the outset, therefore, we must distinguish two kinds of knowing: knowing *how* and knowing *that*. People are said to know how if they possess a certain ability; they are said to know that if they possess factual information. If you are able to read these lines, you already know how to use English, but you may or may not have much factual information about English or about your ability to use it.

A person who knows English will say such things as "She is happy" and "They are happy" and will not say such things as "She are happy" and "They is happy." Saying the first two and avoiding the second two is part of knowing how to speak English. A person who knows how to speak English, however, may not know that the second two examples are wrong because they violate the grammatical rule of number agreement: the subject and the verb of any sentence must agree in number, singular or plural. Knowing this rule is a matter of knowing that.

It is possible to know that without knowing how. You could know that the rule of number agreement also holds in German without knowing how to speak German. In one sense, people who know how to speak English must know the rule of number agreement, because their speech conforms to it, but in another sense, they do not know it if they cannot tell you the rule they are conforming to. That is the difference between knowing how and knowing that.

Fortunately, the *thats* are easier to learn when you already know the *hows*. Because you already know how to use English, I will build on that knowledge. What I will say about English, however, could be said of most other languages, with appropriate substitutions, because I am bringing out general principles, principles that reflect the most universal facts about how human beings can learn and use languages. It is a fundamental assumption that there can be a general theory of language, a theory that is more than a collection of descriptions of particular languages, a theory that can teach us something about the underlying human capacity for language.

Consider this fact: every human society has some form of language. We could not make such a statement if we were not able to recognize languages, and we would not be able to recognize a form of social interaction as a language unless all languages had something in common. In fact, all languages of the world have a great deal in common. They have so much in common that it is possible to teach students general methods for recording and analyzing exotic languages that no linguist or anthropologist has ever studied: all human languages are spoken, and there are general methods for reducing them to writing; all human languages have words, or wordlike segments, and there are general methods for compiling them in dictionaries; all human languages use sentences, and there are general methods for stating their grammatical rules. That such similar forms of communication could arise independently in every human group, however isolated, suggests there is a biological basis for the human capacity for language.

Consider this fact: there are thousands of different languages in the world. Exactly how many there are depends on how you count; some linguists would say there are two languages where other linguists would say there are two dialects of a single language. But, however you count, there are thousands of different languages. This great variation reflects the conventional nature of linguistic knowledge.

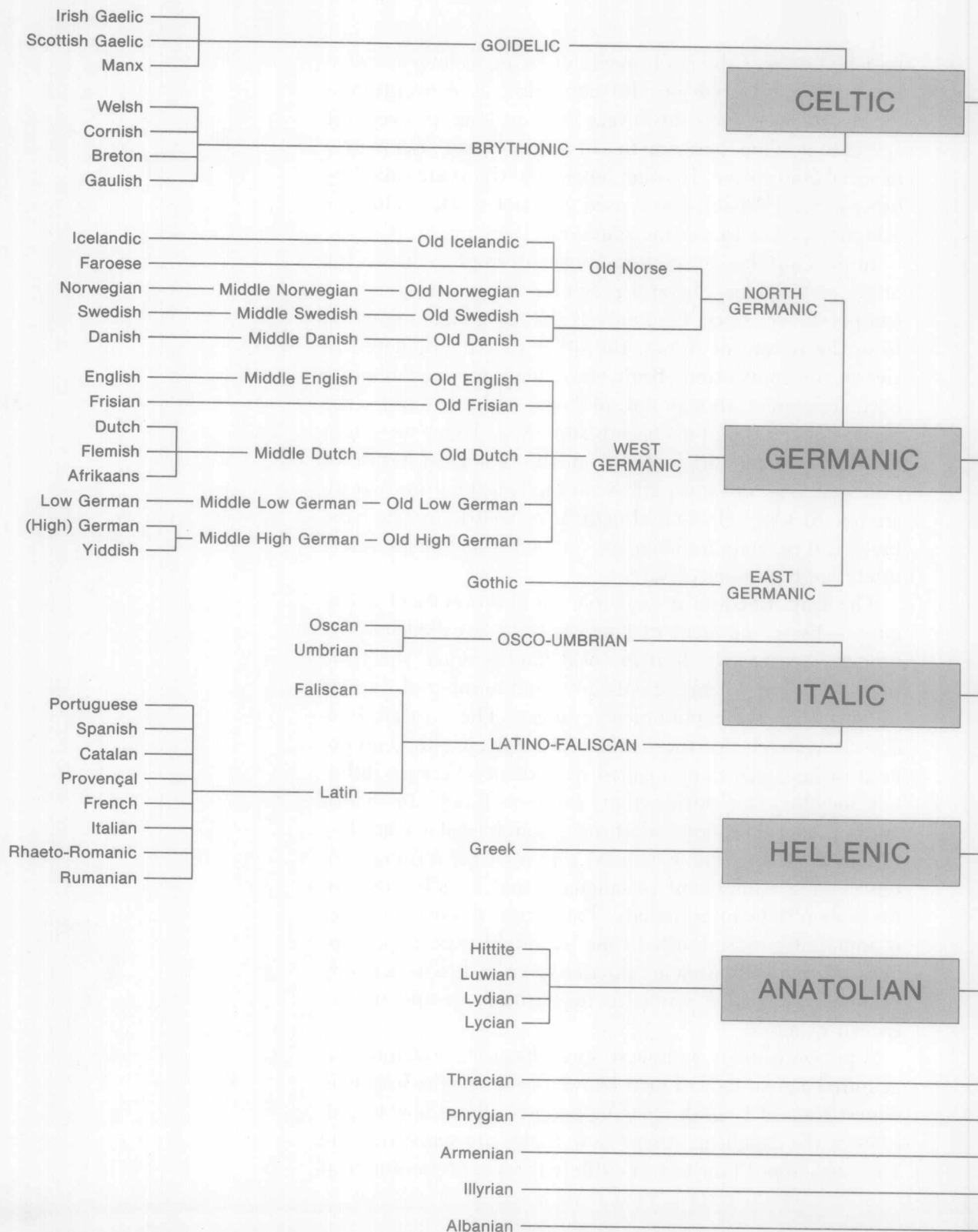
Conventional knowledge, such as knowing that in the United States people drive on the right side of the road, is knowledge of what people have agreed to. It does not mat-

ter which side of the road people drive on, as long as everybody agrees to drive on the same side. A convention is clearly to everyone's advantage just as long as everyone agrees to it. Thus, agreeing to call a chair "chair" is a matter of social convention. In other languages, chairs are called by other names. What name is used does not matter as long as everyone agrees to use the same one.

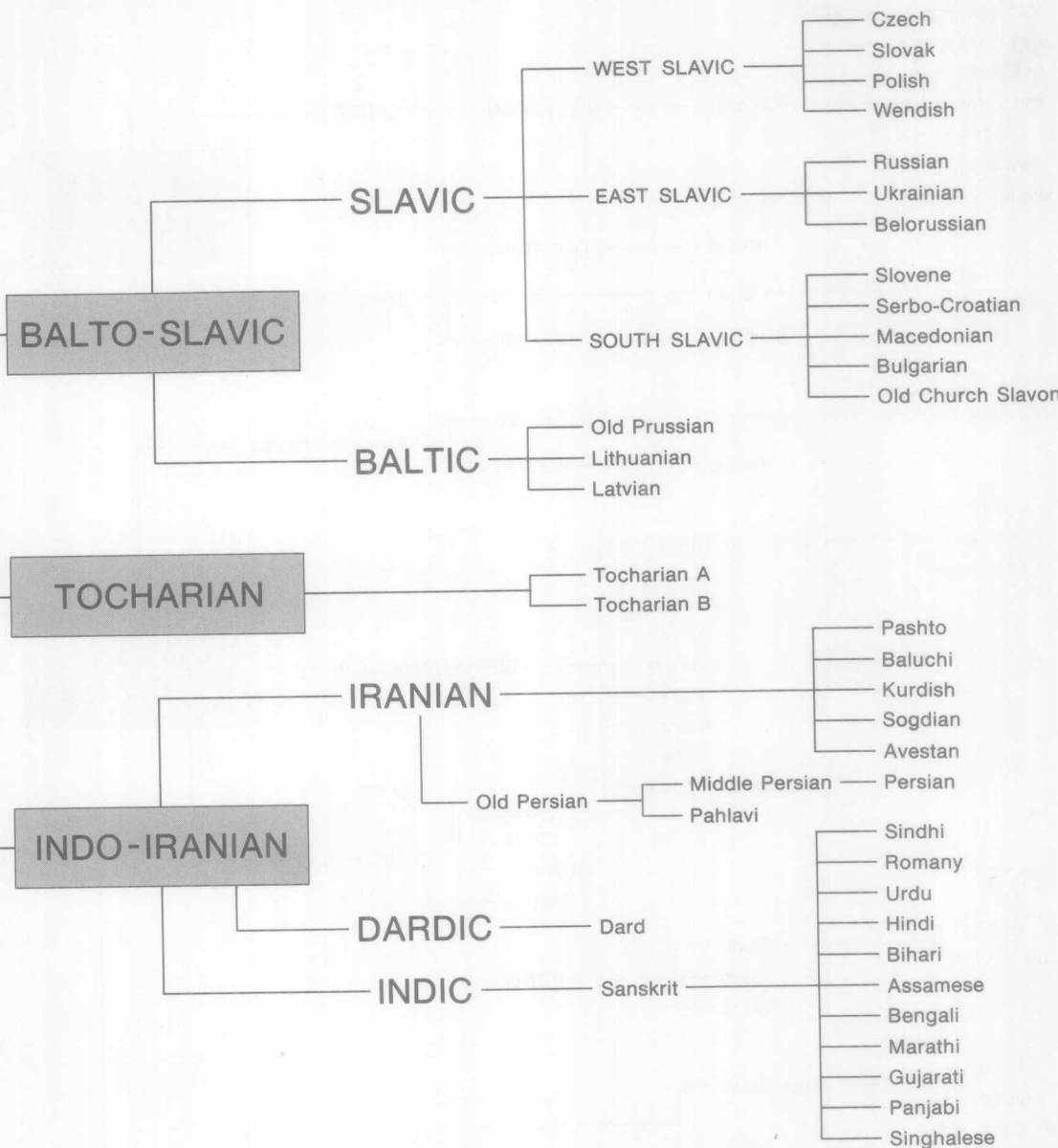
In the *Cratylus*, the earliest known attempt to discuss the origin of language, Socrates presented two views that have competed ever since. One view is that language originated from the nature of things, the other that it originated in custom or convention. Both views have survived because both are correct, though not, perhaps, in the way or for the reasons Socrates and his friends supposed. Today we would say that language originated from the biological nature of human beings, but it is part of our biological nature that we are free to adopt elaborate linguistic conventions. The basic biological capacity for language can be realized in an indefinitely large number of ways.

The least freedom is available for the sounds of a language—the component of language that is called its *phonology*—because the human vocal tract is much the same the world over. There are only a limited number of ways of using it to make communicable noises. The greatest freedom is available for the words of a language—the component of language that is called its *lexicon*—because different societies can decide that different things are worth naming and can adopt whatever phonological forms they can agree on to serve as names. The rules for forming sentences—the component of language that is called its *syntax*—seem to be intermediate. The variety of syntactic rules is apparently more limited than we might expect, perhaps because young children are innately prepared to notice only particular kinds of syntactic regularities present in the speech of adults.

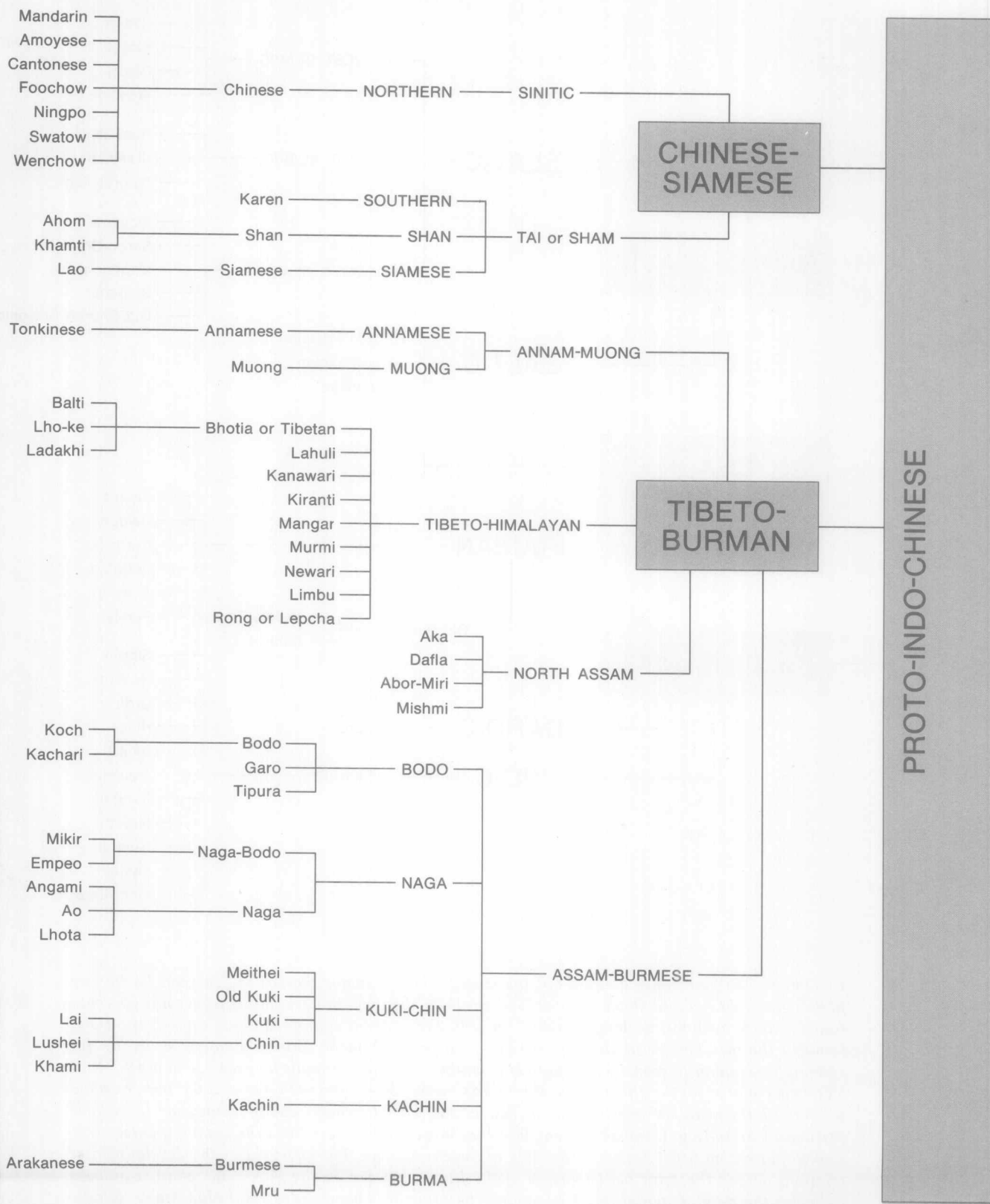
A person who knows how to speak English, therefore, has acquired a great deal of tacit knowledge about the linguistic conventions of English-speaking people—about how to pronounce the language, about how things are named in the language, about how to form different types of grammatical



# PROTO-INDO-EUROPEAN



In 1786 Sir William Jones pointed out the strong relation among Sanskrit, Greek and Latin: "no philologist could examine them all three, without believing them to have sprung from some common source, which, perhaps, no longer exists." In 1816 Franz Bopp confirmed Jones's observation and founded the new science of comparative grammar. In 1822 Jacob Grimm announced his law for systematic sound shifts from Greek, Latin and Sanskrit into the Germanic languages, and in 1875 Karl Verner accounted for the apparent exceptions to Grimm's law. From such studies it has been possible to establish the historical relations among extinct and living languages and to reconstruct the salient features of proto-Indo-European, a language that is assumed to have been the common antecedent spoken more than 6,000 years ago, possibly in eastern Europe. The chart shows the developmental relations among the principal languages of the Indo-European family. A parallel chart (overleaf) indicates the developmental relations among the principal languages of the Indo-Chinese family.



sentences. For all practical purposes, however, this knowledge of linguistic conventions can remain implicit, at the level of simply knowing how.

In school our teachers try to make us self-conscious about what we know how to do: they try to turn knowing how into knowing that. Unfortunately, many schoolteachers emphasize prescriptive rules of good usage and neglect the descriptive rules that are fundamental to any scientific understanding of language. Perhaps justifiably, the teacher is concerned that pupils learn "how to do it correctly." A scientist is less concerned with good usage—whatever you do is correct if everybody you talk to also does it—than with how people are able to use language at all.

Speech, the outward manifestation of the underlying system of knowledge that we call language, is a uniquely human activity. Other animals have other ways to communicate. We can sharpen our conception of human language by considering animal communication and by reviewing what little is known about how language might have evolved. With this perspective, we will next consider our ability to produce and to perceive speech at the rapid rates of conversational interaction.

In order to understand why speech is what it is, however, we must also consider what language is. A look at the syntactic and lexical components of language will make explicit some of the knowledge that normally remains implicit and will demonstrate how complicated human language really is.

Because babies are not born knowing a language or even knowing what a language is, we will also have to consider how they can master it so rapidly and how they come to accept linguistic conventions when no one can explain to them what the conventions are. Much of their learning must depend on insight into the contexts in which language is used. I will close with a discussion of conversational interactions and of the kind of problem solving that is involved in reconstructing a speaker's meaning from the hints he provides by the words he utters.

Each of these topics has been explored in great detail. In order to present a coherent account, I have selected in each case the lines of research that seem to me to bear most



directly on the shared concern to understand the underlying nature of our human capacity for language.

The ancients assumed our incredible gift for language meant we are endowed by the gods with immortal souls. Perhaps we are, but modern science does not accept miracles as serious explanations. Today we demand a naturalistic account, and little by little, such an account is emerging. The account dispels some of the mystery, but it only heightens our respect for the complexity of language and for the mental powers of an organism capable of mastering and using it.