1

Linguistic Theorizing

1.1 Of surveys and theories

Since this book is entitled *A Survey of Linguistic Theories*, it is incumbent upon us to make clear what we mean by a survey, what we mean by a theory, and particularly what we mean by a linguistic theory. We begin with the first of these by arguing that SURVEYS are not the same as HISTORIES. Moreover, we contend that comparison of theoretical proposals in linguistics is possible despite some counterclaim (cf. the question of incommensurability in Kuhn (1962)). After a discussion of the notion of survey, we turn to the characteristics of theories in general and linguistic theories in particular. In the closing section of this chapter we present the schema that will be used for the comparative presentation to follow.

1.1.1 The nature of a survey. In the context of this book, we use the term survey in the same manner as it is used in land measurement. Specifically, we intend to examine the BOUNDARIES, AREA, and ELEVATION (the three notions that form the concerns of the surveyor) of a number of linguistic theories. We regard these three notions as the essential traits that need to be discussed, as there is no unanimity about the boundaries, the dividing lines between linguistic investigations, and the investigations of researchers in other disciplines; it is also a contentious matter what linguistic terrain or area is to be covered, and by what means; and, finally, there is no agreement about which aspects of the covered area are central and thus "elevated" in importance in relation to those aspects which are peripheral.

BOUNDARIES are important because not all investigators agree about limits. The language behavior of humans is indeed a complex

phenomenon and, as a consequence, it may be unclear whether gesturing, the AFFECTIVE INTONATION we use to indicate attitude (e.g., sarcasm, anger, sadness, etc.), or the individual and unique qualities of voice of a specific speaker belong to linguistic study or to psychology or to anthropology. And even in relation to such matters as text structure and pragmatics, when these topics are incorporated within a linguistic theory, it is not always clear precisely how they are to be handled, what domain of language they belong to, and how they relate to other domains.

One is reminded of a similar problem found in natural science. While chemistry is primarily interested in COMPOUNDS, i.e., matter at the molecular level, there is growing interest in the chemistry of submolecular units, extending the subject matter of chemistry into new domains such as nuclear chemistry. Nor is there overlap in this direction only. For example, solid state physics is encroaching on the subject matter classically included within chemistry, for it is concerned with the nature of crystal structure in compounds. In fact, very similar kinds of experiments can be performed by physicists and by chemists on very similar kinds of materials and yet each gets different results and each investigator has a strong sense that this study is physical or chemical, respectively.

In the case of language and speech, there are a great many neighboring disciplines that count either as linguistic periphery or as something quite different from the proper domain of linguistic study. A sampling of some of these related areas includes: (a) psychology of language—the perception and comprehension of verbal signals; (b) sociology of language—language in large groups; (c) speech pathology and neuropsychology—language pathology; (d) post-modernist, critical theory—the properties of verbal texts and the interpretations given to them by readers; (e) history of a given language—the accumulation of borrowed words and language change; (f) biology of communication—the biosystems subtending language; (g) physics of language—the acoustics and aerodynamics of sound production and perception; (h) mathematics of language—mathematical properties of language systems; (i) computer science—artificial intelligence; (j) archaeology—the bearing of fossil hominids on questions relating to language origins; and (k) animal behavior—capacities of subhuman primates, dolphins, birds, bees, and other organisms for communication. With the overlap of domain between linguistics and these neighbors we may speak of psycholinguistics, neurolinguistics, sociolinguistics, etc. But the relationship of related areas to a particular approach to linguistics proper can be quite different. For example, generative transformational

linguistics regards language as a system quite different in nature than the system that underlies some kinds of nonverbal behavior and therefore looks only for DIFFERENCES in kind not SIMILARITIES; tagmemics takes just the opposite position. Thus, in many cases, different theorists establish different boundaries, and a great deal of the manifest divergences among linguistic theories follow from that.

When speaking of AREA, a similar need to distinguish arises. Does the theoretical proposal claim to encompass the entirety of speech and language, or is it more modest in scope? Even if only a limited subarea is the aim, can the principles developed be applied to other areas? For example, in the theoretical proposal known as RELATIONAL GRAMMAR, the grammatical relations (e.g., subject, direct object, indirect object, etc.) are paramount, and such considerations as word order, verb morphology, and constituent structure are useful in developing arguments for the grammatical relations in a particular language; one does not expect grammatical relations in every language to be manifest in the same way. These latter areas are to be dealt with by means of rules external to relational grammar, presumably because principles derived from the study of grammatical relations cannot be extrapolated to all other kinds of relations. On the other hand, the theoretical proposal known as TAGMEMICS regards all-sized pieces of language to be analyzable into the same number and kinds of subunits, whether sounds, words, sentences, or texts; in fact, as mentioned above, tagmemics claims that the same principles and category types can be applied to verbal and nonverbal behavior alike.

The definition of areas can involve more than just differences of comprehensiveness. Whether one part of the language system depends upon another can be the subject of disagreement; in the post-1965 period, for example, one group of linguists (the interpretive semanticists) advocated that sentences, as strings of symbols, could be analyzed syntactically independent of the semantic interpretations assigned to these strings. Others (the generative semanticists) saw the interpretation as primary and the structure of symbol strings as dependent upon them. (We return to this discussion in chapter five.) Thus, linguistic theories differ not only in regard to what is encompassed in language study, but also how the parts are related.

The third task of the surveyor, the determination of ELEVATION, we will take to be prominence in a theory. Theorizing about language differs in the prominence given to particular aspects. The structuralist linguists, for instance, were concerned first and foremost about the notion contrast. Generative transformational linguists regard contrast as less

central and regard the linguistic rule that captures generalizations across languages as primary.

1.1.2 Surveys are not histories. For the purposes of this work, we will regard a survey as something not identical with a history. Therefore, we will not chronicle the development of ideas and the contributions of various personalities as a primary aim, though some of this is also included. For instance, we have chosen not to discuss American or European structuralism in any detail, because—despite their contentions to the contrary—much of contemporary theorizing builds on what was important in structuralism. Nevertheless, the influence of pure structuralism of vintage 1930 or 1940 is waning, as a glance at most international journal articles will tell. We will rather concentrate on approaches that are currently being practiced—what Kuhn (1962:23-34) calls NORMAL SCIENCE, the pursuit of solving problems arising from observation—and experiment within the assumptions of a given pattern or accepted model. The history of linguistics is a discipline worthy of study by specialists, but in linguistics as in other fields, comprehensive knowledge of the history of linguistics is not a requisite of every linguistic practitioner.

1.1.3 Surveys can be comparative. We propose to make this survey of linguistic theories a comparative one. There is, however, an inherent danger in the comparison of theories. *The Structure of Scientific Revolutions* (Kuhn 1962) has taken the position that competing scientific theories are radically incommensurable, and thus cannot be compared. This incommensurability is the result of the fact that theories (Kuhn calls theories of this type PARADIGMS) define for themselves what the interesting problems in a discipline are, what methods will be used to solve them, what standards will be expected of a solution, what role argumentation will play, how much the theory is to be under-determined by the data, and other such questions. Thus, two competitors differ so radically that one cannot engage meaningfully in any sort of comparison.

> In the first place, the proponents of competing paradigms will often disagree about the list of problems that any candidate for paradigm must resolve...More is involved, however, than the incommensurability of standards. Since new paradigms are born from old ones, they ordinarily incorporate much of the vocabulary and apparatus, both conceptual and manipulative, that the traditional paradigm has previously employed. But they seldom employ these borrowed elements in quite the traditional way. (Kuhn 1962:148–9)

From the philosopher Stephen C. Pepper (1942) we hear a similar warning. For him there are two fundamentally different sorts of theories. WORLD HYPOTHESES reject nothing as irrelevant and are thus defined as "unrestricted products of knowledge." These contrast with THEORIES concerned with restricted fields of knowledge exemplified by works such as Euclid's *Elements* and Darwin's *The Origin of Species*. World hypotheses result from ROOT METAPHORS, which are attempts to understand the world by using knowledge of one area as a pattern for understanding other areas. These root metaphors perform three functions: (a) they connect world hypotheses to common sense; (b) they illuminate the nature of hypotheses; and (c) they can be an instrument for evaluating hypotheses. Since a world hypothesis is determined by a root metaphor, and since root metaphors differ from one world hypothesis to another, world hypotheses cannot be compared. It also does not strengthen one world hypothesis if one exhibits the shortcomings of another.

> ...a great proportion of philosophical—and not only philosophical—books give a large part of their space to polemic, finding the faults in rival theories with an idea that this helps to establish the theory proposed. The cognitive value of a hypothesis is not one jot increased by the cognitive errors of other hypotheses...If a theory is any good it can stand on its own evidence. The only reason for referring to other theories in constructive cognitive endeavors is to find out what other evidence they may suggest, or other matters of positive cognitive value. (Pepper 1942:101)

According to Pepper, it is also "confusing" to mix world hypotheses. World hypotheses are "mutually exclusive."

Two comments must be made about Pepper's suggestion. First of all, as mentioned above, he has specifically excluded restricted fields of knowledge from consideration, because they—unlike world hypotheses (e.g., Plato's *Republic*, Aristotle's *Metaphysics*, and Hume's *Treatise*)—can "reject facts as not belonging to their field if the facts do not fit properly within the definitions and hypotheses framed for the field" (1942:1). Linguistic theories, however, are presumably an example of such restricted theories, not world hypotheses. It should not be surprising, therefore, if Pepper's suggestions do not apply to language theorizing. Secondly, it seems to us that Pepper takes a rather optimistic view of

the potential role of evidence in persuading a practitioner to give up his world hypothesis in favor of another. Max Planck once sadly remarked:

> A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar (sic) with it. (Kuhn 1962:151)

Kuhn's position on comparing theories (paradigms) has made its way into the arguments of linguists. Thus, Jones abandons any attempt at comparison saying:

> Ultimately choice of theories is a question of values, of choice of axioms. At best, one theory can hope to win through "conversion," but never by "proof"...
>
> Ultimately, then, each theory must be evaluated for its own merits, and NOT by comparison with other theories. In particular, how successfully a theory meets its stated purposes and goals, and the general usefulness or applicability of the theory, are what is to be evaluated. (1980:88)

Yet, such claims of radical incommensurability—both in natural science and in linguistics—are based on a view that scientists are totally irrational and dogmatic; that linguists are incapable at any level of seeing the world or possible world described by a linguistic paradigm in competition with their own. As Laudan argues, however, this logic is flawed and, in fact, there are ways of comparing without seeing other worlds.

> But *its central flaw*, for our purposes, *lies in its presumption that rational choice can be made between theories only if those theories can be translated into one another's language or into a third "theory-neutral" language*...I shall maintain, to the contrary, that even if we accept the view that all observations are theory-laden to a degree that makes their contents inseparable from the theory which is used to express them, it is still possible to outline machinery for objective, rational comparisons between competing scientific theories and research traditions...What this approach ignores is that *neither* correspondence rules *nor* a theory-free observation language are necessary for comparing the empirical consequences of competing theories. For even *without* correspondence rules and without a purely observational language, we can still talk meaningfully about different theories being *about the same problem,* even when the specific characterization of that problem is crucially dependent upon many theoretical assumptions. [His emphasis] (1977:142)

As Laudan goes on to point out, Kuhn and other radical noncomparativists such as Feyerabend have concluded that since some empirical problems are theory-laden, that all such problems are (Feyerabend 1978). But most linguists, of whatever school, feel this is not so.

In linguistic theorizing, for example, are we to believe that the morphology of English plurality is theory-laden even at the level of observation? There are the three odd types of encoding: (a) the S-ADDITIVE strategy (e.g., *boy* vs. *boy-s* or *key* vs. *key-s*); (b) the MODULATORY or umlaut strategy (e.g., *foot* vs. *feet* or *goose* vs. *geese*); and (c) the NONICONIC and unmarked plural (e.g., *deer* vs. *deer* or *fish* vs. *fish*). While different analysts may differ as to whether forms such as *feet* or *deer* contain two morphemes each, how can it be said that the observations themselves are influenced by one's theoretical perspective? As long as the low-level theoretical assumptions needed to characterize an observation are not crucially dependent upon the high-level assumptions in a paradigm, then the problem to be solved by each of the theories can be said to be the same. In Laudan's terms the two sets of assumptions in such a case are disjoint.

It is true that in linguistics many problems cannot be stated in a theory-independent fashion, e.g., what is the role of meaning in determining form or what is the role of function in determining form? But, according to Laudan, one can discuss these issues comparatively as long as one is talking about the same problem. Moreover, failing to attempt a comparison or an evaluation and relying only on how successfully a theory meets its own stated aims makes linguistic theorizing a matter of whim. Only dogged, irrational loyalty and careful "crank turning" is required, so if a good technician can properly churn through the chosen axioms to the ultimate theorems of a theory and do so in a manner attracting popularity, then the theory based on these axioms must be judged satisfactory. But from this point of view there would be no sense to the term "progress of knowledge."

In addition, according to this reasoning, there would have been no motive to retreat from Ptolemy's view of the universe. His geocentric view was accepted for over 1,500 years. He could correctly predict the motion of the planets and understood the precession of equinoxes. The planets in his view were fastened to giant invisible spheres with the earth at the center. Instead of being pinned in fixed fashion to these spheres, however, each planet was attached to an off-center wheel that

was said to account for the meandering paths each took in the night sky (Sagan 1980:52–3). When the Copernican heliocentric model of the universe appeared in 1543, it was equally good at predicting planetary motion but offended many who held that man is in the image of the Divine and that his planet should be the center of things; moreover, it disrupted the notion of the "music of the spheres." Nevertheless, heliocentric astronomy did ultimately dislodge Ptolemy's theory when an increase in the accuracy of measurement of planetary orbits allowed Kepler to discover the elliptical and not circular path of Mars.

In light of this case history from astronomy, we conclude that comparison and evaluation of theories with regard to problem-solving capacity may not be fruitless endeavors. Once problems can be stated in terms of low-level theoretical concepts, and once such problems can be characterized as being solved, then we begin to approach an evaluation of the effectiveness of a given research tradition. If a tradition can solve all the problems it sets for itself and thereby create no anomalies, and if it can expand its domain of explained problems, reducing the important unsolved and previously anomalous ones, then one can speak of scientific progress (Laudan 1977:146). In this view, comparison and evaluation can thus be seen as possible. Therefore, our survey will seek to be a comparative and evaluative view of the topology of current (post-1965) linguistic theorizing.

1.2 Scientific progress and the logic of research

In the traditional view, scientific progress was regarded as a cumulative process. Like the filling of water into a bathtub, generations of scientists toiled in the vineyards of observation and experiment, each adding through this normal science to collective knowledge. From the experience of observation and experimentation one could, by virtue of the method of induction, arrive at the regularities. From these regularities, in turn, there remained the second inductive step to natural laws, the generalizations that underlie the observed behavior. These laws were timelessly valid and revealed something about the nature of things.

In this section, we discuss various alternatives that have been advanced regarding the progress of science. We discuss inductive and deductive approaches, and the question of discovery, making reference to ideas of various philosophers.

1.2.1 Induction and irrationality. Consider as an example of discovery, the work of Isaac Newton. From the observation of objects in motion and at rest, Newton discovered the law of inertia. Yet, this law came into conflict with the motion of the moon. From the failure of the moon to fly out of its circular orbit around the earth, he further concluded that an unknown force must bind the moon to the earth and that it was that very same force that caused an apple to fall to the ground. This discovery led to positing the laws of gravity. But, according to David Hume, no rational justification can be provided for the induction from observations to such laws. That is, just because the sun has risen every morning of our lives and every morning of human history, this doesn't allow us to conclude that it will rise tomorrow morning. To go from observations, which are formulated as singular statements (those true of individual cases or times), to laws, which are formulated as universal statements (those true in general), an induction principle is needed. But, induction principles are themselves universal statements and demand support in their own right (Popper 1962, Stegmüller 1969, 1975:488). Thus, Hume concludes that empirical sciences proceed inductively but irrationally in the sense that their underlying principles are ungrounded and unjustified.

1.2.2 Induction and rationality. Hume's conclusions resulted in numerous attempts at justifying INDUCTIVE INFERENCE as a method. This striving became especially intense in the twentieth century. Carnap attempted to construct an inductive logic to parallel the long-established methods of deductive logic. This undertaking—had it succeeded—would have changed the empirical sciences into inductive but rational pursuits. The philosopher Reichenbach made an important distinction in the inductive procedure. He speaks of induction in the CONTEXT OF DISCOVERY and in the CONTEXT OF JUSTIFICATION. Hume and Carnap had two different contexts in mind when speaking of induction; Hume the former context and Carnap the latter.

1.2.3 Deduction and rationality. In opposition to the solutions of Carnap and Reichenbach to the dilemma of irrationality in induction as posed by Hume, the Viennese philosopher Karl Popper claimed that induction cannot be used either in a context of discovery or in a context of justification. Popper says the methods of discovery are not conscious ones and in principle they remain clouded in speculation. One might cite in confirmation of Popper the words of discoverers about their discoveries. According to Sagan (1980:69), Newton is supposed to have said that he discovered the foundations of a theory of universal

gravitation "by thinking upon them." Einstein, the man called the Newton of the twentieth century, was as mystified by the birth of an idea as the rest of us. Of the time that led to that magical year 1905, in which he punctuated a decade of preparation with the proposal of The Special Theory of Relativity, his biographer Peter Michelmore says:

> He worked on and on through 1904. One puzzle led to another. His brain was on fire. His body exhausted. He could not eat. He could not sleep. The speed of light never varies. When people spoke to him, he did not hear. He wandered in a daze. At times, he wondered if this was the way to insanity...
>
> Perhaps because of the sudden relaxation after months of intense brain work, that night the missing pieces fell into place. Relativity yielded and came scrambling into the world...This had come from the inventive element of human reason that Kant had written about. Einstein had proved his creativity. He was ecstatic. (1962:44–45)

Einstein says in his own words in the Kyoto lecture of 1922:

> Unexpectedly a friend of mine in Bern then helped me. That was a very beautiful day when I visited him and began to talk with him as follows: "I have recently had a question which was difficult for me to understand. So I came here today to bring with me a battle on the question." Trying a lot of discussions with him, I could suddenly comprehend the matter. Next day I visited him again and said to him without greeting: "Thank you. I've completely solved the problem." (quoted from Pais 1982:139)

Or a more recent story is equally enlightening. A Stanford University graduate student in 1979, Alan H. Guth, proposed a brilliant new account of the universe before the 'big bang'. He has posited a kind of cosmic 'inflation' for one-trillionth of a second just before the explosion. Of the germ of the idea he has said that he had no idea why the equations began to come to him just when they did. "Without my knowing it the ideas were already in my head, and they seemed to come together in one fell swoop" (Waldrop 1984).

These accounts sound little like the experiences of persons wrapped in cool inductive thinking but rather of men possessed by their own creative intuition. Moreover, a *post hoc* reconstruction of the inductive steps that led to discovery is probably not possible since some kinds of noncontinuous, catastrophic (in the sense of René Thom) development

seems to be involved. Nor does it seem very important to the involved person to confirm the intervening steps that led to breakthrough.

In addition to this claim regarding discovery, Popper also baldly asserts that a grounding or justification of theories or hypotheses does not exist. Nevertheless, such theories differ from pure metaphysical speculation because they must be put to the test of rigorous deductive confirmation. One proceeds by tentatively assuming a hypothesis and then trying to falsify it. According to Popper (1962:32–34), four tests are involved: (a) The conclusions of the theory are compared logically; (b) the logical form of the theory is considered (e.g., is it tautological?); (c) in comparison with competing theories it must count as a scientific advance; and (d) the theory must be tested with regard to its derivative empirical applications. The results of this last test are what Popper calls PREDICTIONS. If the predictions are confirmed or verified, then such a positive result is only temporary support, for subsequent negative results will always be able to overthrow the prediction and the corresponding theory that has led to it. Should a theory stand up to the four tests and exhibit no negative predictions, then it counts as corroborated. Therefore, Popper sees progress in science as noninductive (the theories are assumed and not induced logically from observation) but rational (the theories are testable with explicitly defined tests).

We have already mentioned Thomas S. Kuhn's *The Structure of Scientific Revolutions* in connection with the comparison of theories or PARADIGMS. This book is, in a sense, the most radical of proposals about the philosophy of science, because Kuhn advocates that research employs procedures that are neither inductive nor rational. He agrees with Popper in testing hypotheses but differs in hypothesis abandonment, because he pleads that progress—just like discovery itself—occurs in a discontinuous, catastrophic manner. Knowledge does not accumulate like water in the bathtub but instead through periods of perturbation, which he calls SCIENTIFIC REVOLUTIONS. It is as if the plug in the bathtub were pulled out and new water put in; the same observations must be accounted for but they are accounted for in such a way as to give them a newly-shaped interpretation. These new containers represent developments "sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity. Simultaneously, [they are] sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve" (Kuhn 1962:10). Such achievements which Kuhn calls paradigms have names like Ptolemaic, Copernican, Newtonian, Einsteinian, or Maxwellian. He further asserts that falsification of predictions should not be equated with anomalous experiences.

> ...no theory ever solves all the puzzles with which it is confronted at a given time; nor are the solutions already achieved often perfect. On the contrary, it is just the incompleteness and imperfection of the existing data-theory fit, at any time, that define many of the puzzles that characterize normal science...But falsification, though it surely occurs, does not happen with, or simply because of, the emergence of [such] an anomaly or falsifying instance. (Kuhn 1962:146)

In Kuhn's view, scientific progress can be characterized as follows. After a new paradigm has established itself, then normal science, problem solving, takes place. During this initial phase, few textbooks are written; the literature is mostly found in highly intricate journal articles. This is the period of paradigm articulation. As long as a paradigm holds sway, the basic assumptions, methods, and standards for solutions are not questioned by its practitioners. This stability is necessary for the articulation. A mature paradigm is recognized by the appearance of textbooks for the indoctrination of an upcoming generation of scientists. A paradigm in decay can be recognized by the buildup of anomalous problems in the course of normal science. At some point, a relatively young scientist, usually an outsider, enters the picture to propose a new paradigm. If he or she is successful in turning anomalous problems into solved problems and thereby winning adherents, then the next catastrophic event is at hand. In science, evolution is by revolution.

For the nonempirical sciences Lakatos (1976) refines many of Kuhn's concepts, including replacing Kuhn's term PARADIGM by RESEARCH TRADITION. In light of the distinctions Lakatos makes, we should change the title of this book to "Survey of linguistic research traditions." What we discuss and compare is namely these broadly defined mixes of ontology, methodology, and specific proposal. Such "super-theories" are composed of three subparts: (a) a hard-core of fundamentally unchallengeable assumptions called the NEGATIVE HEURISTIC; (b) a belt of POSITIVE HEURISTIC that admits of modification without repudiation of the research tradition; and (c) a number of COMPOSITE THEORIES that recapitulate the general macrotheory in the microcosm of a specific domain. Lakatos expresses a less radical stance than Kuhn on the comparison of theories, agreeing that such is possible. While Lakatos represents an improvement over Kuhn, he still maintains the tenet of scientific irrationalism; he persists in the view that at least the negative heuristic aspects of research traditions (like Kuhn's paradigms) cannot be changed without overthrowing them completely and he claims that the "accumulation of anomalies has no bearing on the appraisal of a

research tradition" (Laudan 1977:78). Yet some of these ideas are strongly refuted by the history of science and each also extracts a certain methodological and metaphysical commitment on the part of practitioners. Each goes through a series of formulations with a relatively long history even though theories themselves may be short-lived. From Lakatos we take the useful distinction between the general methods for solving problems and a general ontology of nature; these are part of the research tradition. A theory, on the other hand, provides a particular ontology of nature and gives the practitioner a number of specific and testable laws about nature. In the upcoming chapters, we will use these two divisions, general ontology and specific ontology, as two of the three pillars upon which the various linguistic research traditions and theories are presented. We will also examine the ability of theories to solve problems.

1.3 A brief history of the axiomatization of mathematics

Up to this point we have discussed theorizing in empirical sciences and have had little to say about linguistics. As distant a point as it might seem, we now begin to turn our gaze more toward the ultimate object of this work. We will not, however, do so directly but rather circuitously by looking first at some of the major landmarks in pure mathematics over the course of the last one hundred years. As we hope to show, there is a direct linkage between some of the developments in this neighboring discipline and the development of system linguistics since 1965.

In his classic work on the history of mathematics, Ball (1906) claims that "the history of mathematics cannot with certainty be traced back to any school or period before that of the Ionian Greeks." That is not to say that older cultures had no sense of practical mathematics. Indeed, many cultures such as the Egyptians, Chinese, and Phoenicians were capable of practical calculation involving numeration, mechanics, and land-surveying. While the Greeks themselves saw the origins of geometry in Egyptian culture—the word itself means 'earth measure'—still the Ionian mathematicians specialized in discovering the lawlike, gnomic, immutable behavior of figures, independent of any particular instance of them. Ball says:

> Now the Greek geometricians, as far as we can judge by their extant works, always dealt with the science as an abstract

> one: they sought for theorems which should be absolutely true... (1960:5)

The crown of classical mathematics was achieved in Euclid's *Elements* which was so successful that Ball reported in 1906 that this book had been supplanted on the continent only about one hundred years earlier but that the version based on Simson's 1758 edition was still in active use in England at that time. The feature of Euclid's *Elements* held in special esteem was the method of presentation. Propositions were arranged in a chain from the most obvious to results of considerable complexity. These most obvious starting points are known as POSTULATES or AXIOMS. The five postulates of Euclid are found in (1).

(1) a. A straight line segment can be drawn joining any two points.

b. Any straight line segment can be extended indefinitely in a straight line.

c. Given any straight line segment, a circle can be drawn having the segment as radius and one end point as center.

d. All right angles are congruent.

e. If two lines are drawn which intersect a third in such a way that the sum of the inner angles on one side is less than two right angles, then the two lines inevitably must intersect each other on that side if extended far enough.

The methods of inference, ways of proceeding from one axiom or a combination of axioms to statements that could be shown to follow from the axioms, was a tradition established by the Greeks. These latter-named statements are known as THEOREMS and the demonstration that a theorem follows from an axiom or axioms by a rule of inference is known as a DERIVATION or PROOF. This technique as a whole is called the AXIOMATIC METHOD. Generation after generation of mathematicians have been impressed with the rigor and elegance of this kind of device.

Toward the end of the nineteenth century, it was discovered that quite interesting and fruitful results could be obtained by altering or giving up Euclid's fifth postulate, the parallel axiom. It had generally been assumed that the abandonment of any one of the postulates—since

no one had been able to show that any one postulate was a consequence of any of the other four postulates—would result in the destruction of the entire system. Such proved, however, not to be the case. Instead, abandonment of the fifth postulate yielded a new geometry, hyperbolic geometry. In similar fashion, abandonment of other postulates produced elliptical geometry. In other words, if the axioms were altered, then the set of theorems derivable was simply a different set of theorems, not chaos. In this insight, mathematicians of that age saw the opportunity of redefining all of mathematics axiomatically. By taking different axioms and different rules of inference, much previous work could be recast in a more rigorous, elegant, and ultimately more simple mold. It was in this sense that Bertrand Russell answered the question "What is mathematics?" by saying in *Mysticism and Logic*:

> Pure mathematics consists entirely of assertions to the effect that if such and such a proposition is true of *anything*, then such and such another proposition is true of that thing. It is essential not to discuss whether the first proposition is really true, and not to mention what the anything is of which it is supposed to be true...Thus mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true. (1910:75)

The axiomatic theory held much promise of ridding mathematics of any internal inconsistency and of becoming the forge for new, more powerful subareas of the discipline. The mathematician who was most influential in pushing the axiomatic method instead of informal methods, which came to be known as naive methods (cf. for example Halmos (1960) *Naive Set Theory*), was David Hilbert. To accomplish this end, Hilbert proposed eliminating any meaning from expressions of a system and constructing a calculus, rules for producing all the sign strings, theorems, in a formalized way. Thus, the added difficulty of formalism would pay the dividend of "naked clarity" (Nagel and Newman 1958:27) of allowing testing for consistency. Because symbols were purged of their meaning, one could see whether strings of these symbols were put together according to the precisely stated rules of the calculus and whether the strings of symbols were well-formed according to the rules of the system. Any interpretation of these symbols was not part of mathematics but part of "meta-mathematics," the language about mathematics.

1.4 Chomsky's definition of a grammar

Now that the groundwork has been laid we proceed to discussing the common basis upon which the grammar theories to be discussed will be compared. As Laudan (1977) has stated, it is not necessary to translate one research tradition into a language used by another for the purposes of comparison. While this is, however, not a formal requirement, it may be useful to establish some sort of common frame in order to trace the specifics of a particular theory. This is not the same as eclecticism (mixing of theories), nor does it have to lead to the error of comparing incommensurables. The common frame to be used here is Chomsky's formal definition of a grammar.

A specific subtype of axiomatic system that leads to Chomsky's definition of a grammar is the SEMI-THUE SYSTEM. An in-depth description of the relationship of semi-Thue systems, Thue systems, and other axiomatic systems that might be relevant to linguistic theory is beyond the scope of this discussion. See Wall (1972) for a good account of these matters. For our purposes, it is sufficient to note that such a semi-Thue system contains three parts: (a) the axioms, sometimes called the START SYMBOLS, because all derivations must begin with an axiom; (b) rules (of inference), sometimes called PRODUCTIONS; and (c) THEOREMS, the strings of symbols produced from the axioms via the rules of inference. The specific aspect which characteristically determines a semi-Thue system is a restriction on the kinds of productions allowed. In the semi-Thue system, A and B stand for the vocabulary of the language, classes of symbols that are allowed to occur. The symbol $(A \cup B)^*$ is called a FREE MONOID and stands for the set of well-formed strings formed over the vocabulary sets A and B, and means all the properly constructed sequences of 'words'.[1]

(2) Definition of a semi-Thue system

A semi-Thue system is an extended axiomatic system (A, B, S, P) so that each rule of inference (production) fits the mold:

$$xXy \rightarrow xyY,$$

where x and y are strings from $(A \cup B)^*$ and X and Y are variables from the set $(A \cup B)^*$ as well.

[1] A free monoid is the set of strings that includes all the terminal strings and all the strings that can be built up by these rules that contain terminal, nonterminal, or combinations of them, e.g., in decimal arithmetic a string ACA = 4 belongs to the free monoid, as does 5CA = 4, etc.

One reason that Chomsky's definition of a grammar may be capable of aiding comparison without distortion is that his conception is a very general—and for that reason vague—definition.

Bearing in mind the preceding discussion, one can conceive of a natural language as a set of strings of symbols, the words of the language, that have been put together by rules. Of course, any real human language is more than just the strings themselves. These strings also have interpretations, i.e., they are meaning-bearing. This viewpoint emphasizes the similarity of natural languages to other kinds of language. For example, the language called arithmetic would be just the set of strings combined from the natural numbers and the two-place operators: +, −, x, ÷, and =. For English and for arithmetic, some strings would be well-formed, for example, *the King was in the countinghouse* and for arithmetic $2 + 2 = 4$. Some conceivable strings would not be well-formed, such as **The was King in the countinghouse* and $*2 + = 2\ 4$. These illustrate that WELL-FORMEDNESS is a judgment about the SYNTAX or GRAMMAR of languages. In addition to being unacceptable because they are not well-formed, strings can also be unacceptable because they have no meaningful interpretation. Thus, the following strings from English and decimal arithmetic are well-formed but meaningless or false. (There are other accounts of the relationship of well-formedness and meaningfulness—the one discussed here is the usual one assumed by linguists.) *!the Confucianism was in the countinghouse* and $!2 + 2 = 5$. Notice that strings may have to be interpreted with respect to a given context or set of circumstances; absolute context-independent meaninglessness may not be valid. For example, the string $1 + 1 = 10$ evaluated in decimal arithmetic will be false but true in binary arithmetic, in which *10* corresponds to *2* in the decimal system. This point will be argued again below.

Chomsky (1956) claims that a formal model of a grammar can be formulated as:

> The grammar G of a language L consists of four kinds of things, i.e.,
>
> $$G = \{V_T, V_{NT}, \{S\}, P\}.$$
>
> V_T and V_{NT} are together the vocabulary (sets) of TERMINAL and NONTERMINAL strings respectively. Moreover, V_T and V_{NT} must be disjoint (i.e., not overlap in membership). S is the START SYMBOL. P is the set of RULES or PRODUCTIONS, which must be finite in number and conform to the scheme

$$\alpha x \beta \rightarrow \alpha y \beta,$$

where x and y are from the vocabulary, i.e., V_T or V_{NT} and the symbols α and β come from the free monoid $(V_T \cup V_{NT})^*$.

This definition certainly needs some illustration. Consider an example of a grammar in which the following values of V_T, V_{NT}, S, and P occur.

(3) V_T = the set of natural numbers N and +, −, x, ÷, and =
V_{NT} = A, B, C, and S

The set of start symbols contains just the symbol S

P = {S → A B A, A → A C A, A → a ∈ N, C → {+, −, x, ÷}, B → =}
N is the set of natural numbers.

The symbol → is to be read "rewrite as." Some of the derivations that this grammar produces are shown in (4)–(6).

(4)

```
          S
        A B A
      A C A B A
      2 + 2 = 4
```

(5)

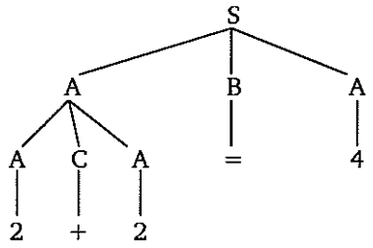
```
          S
        A B A
      A C A B A
    A C A B A C A
    2 + 2 = 3 + 1
```


(6)

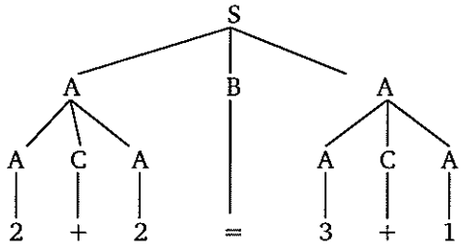
```
              S
            A B A
      A C A B A C A
    A C A B A C A C A
  A C A C A B A C A C A
  2 + 1 − 2 = 1 x 2 − 1
```

More useful to linguists than derivations such as the above are phrase markers, which are merely enriched IMMEDIATE CONSTITUENT DIAGRAMS of the structuralists. In phrase markers, one can see the overall structural relationship of the rule applications more clearly. On the other hand, the order of application of rules is no longer evident. The phrase marker equivalents of the above are shown in (7)–(9).

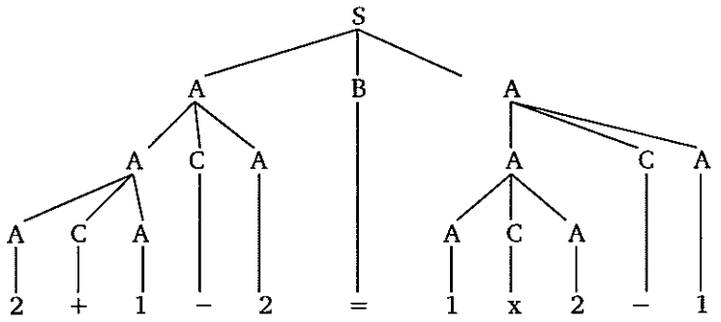
(7)



(8)



(9)



The collection of well-formed strings produced by the grammar, i.e., all those that are formed from the rules or productions and contain only items from the vocabulary, are called THE LANGUAGE OF G. In the above example, the set of strings included not only the strings whose phrase markers have been exhibited but an unlimited number of additional ones, a great many of which will be false in arithmetic. For instance, the grammar will generate symbol concatenations such as: 2 + 2 = 7,213; 6 − 0 = 8; 15 x 3 = 0; etc. These still need an interpretation before one can speak of an INTERPRETED LANGUAGE, such as arithmetic. We see, however, that one property of a grammar is that it conforms to Chomsky's definition of a grammar stated above.

Another important property of a grammar is RECURSION. If the productions (which are equivalent to the rules of inference in an axiomatic system) contain the same symbol on both the right and left side of an arrow, then the rules are recursive. The grammar portrayed in (3) above is recursive, because in the second rule of P the symbol A appears on both sides of the arrow. (Another type of recursion involves a pair of rules such that, for each rule, a symbol on the right side of the arrow in one is on the left side in the other.)

Chomsky showed in early work that languages generated by formal grammars have different properties according to restrictions put onto the productions or rules. In the descriptions of grammar types that follow, the central concept is the string; strings can be null (meaning that there is no string there) or nonnull (meaning that there is a string there).

(10) A TYPE 0 or UNRESTRICTED REWRITING SYSTEM has no further restrictions beyond those of formal grammars.

(11) TYPE 1 or CONTEXT-SENSITIVE GRAMMARS have the restriction that every rule must conform to the scheme

$$\alpha A \beta \rightarrow \alpha B \beta$$

alternatively

$$A \rightarrow B \,/\, \alpha \_\_ \beta$$

in which the unspecified strings α and β, but not the single nonterminal symbol B, may be the null string.

(12) TYPE 2 or CONTEXT-FREE GRAMMARS have the restrictions of Type 0 and Type 1 grammars and additionally the condition that all rules have the form

$$A \rightarrow \Omega$$

Contrary to Type 1 grammars, α and β must be the null string; moreover, the single nonterminal symbol A must be replaced by some unspecified string Ω that is not the null string.

(13) TYPE 3 or FINITE-STATE GRAMMARS have the conditions of Types 0 through 2 plus the additional constraint that each production must conform to the scheme $A \rightarrow xB$ or $A \rightarrow x$, where x is not the null string and A and B are single elements from the set of nonterminal symbols.

It is especially important to observe that a Type 1 grammar (context-sensitive) is more powerful than a Type 2 grammar (context-free), because a Type 1 grammar contains a Type 2 grammar as a special case. One should not, for instance, believe that a Type 1 grammar is more "constrained" because it "requires a context," but instead note that the context "required" can also be null.

In order to become familiar with grammar types, the reader should consider the following languages and try to devise grammars for them: the language called $(ab)^n$ which is the set {ab, abab, ababab, abababab,...} and the language a^nb^n which is the set {ab, aabb, aaabbb, aaaabbbb,...}. What kind of grammar is the following and what strings does it produce? $\{V_T = \{a, b\}, V_{NT} = S, S = S, P = \{S \rightarrow (S)ab\}\}$.

The terminology and concepts just introduced will turn out to be general enough to characterize most of the types of linguistic theorizing to

be discussed below. There will, however, also be examples that do not conform to these principles. Nevertheless, this scheme will help us to classify the proposals as to grammar types and thus estimate their expressive (generative) capacity. Some very interesting results have been obtained concerning capacity and these results will have bearing on the individual approaches.

1.5 Linguistics: A natural science, a social science, or a human science?

Linguistic theorizing reflects to a great degree the most central of all questions in linguistics: what is language? Depending on how this question is answered, linguists may regard their occupation as one of the humanities, one of the social sciences or, perhaps, one of the natural sciences. The most important factors in the equation are: (a) the role of the utterance object, as Bloomfield said "the noises we make with our faces;" (b) the role of the individual human speaker and talker or hearer and listener; and (c) the role of groups of individuals, speech communities at one time or over time. Earlier we presented Chomsky's definition of a formal grammar and its corresponding account of a formal language as the set of symbol strings produced by a grammar. By viewing language as a system of objects whose properties are reflected in the on-paper construct, it is clear that a natural science view of language is being favored. Most of the approaches to be compared in this book will be of this type. Of course, the human behind the system will not be totally excluded, because genetically transmitted constraints of mind (universal grammar), human behavior as a unity, and/or neural circuitry may figure in this or that paradigm. Nevertheless, the complexity of utterance objects of humans dictates that these formal factors receive the most attention in normal science practice even if the investigator may occasionally do or say otherwise.

In one sense, linguists who study utterance objects exclusively still may be studying the human animal behind them. In the language system, many dimensions show a characteristic bias that reveals a prototypical speaker. Vowel height (distance between tongue and palate) in many languages, for example, correlates to the deictic categories in the demonstrative system; if there are two positions on a scale, then the ego-distal demonstrative form is likely to have a low (distant) vowel and the ego-proximal the high vowel. Cf. French *ici* versus *la bas;* Chinese *zhei* versus *na:* Amis (an Austronesian language) *kiya* versus *koya* and Mayerthaler (1981) for many more examples. Still another

illustration of the prototypical speaker's shadow cast in the language system is the order in irreversible pairs of the type *day and night, now and then, sight and sound.* The first seems to be the perceptually more accessible of the two. Our senses are predetermined for light not darkness, for the temporally near, and for the sight sense to dominate over others.

A branch of linguistic theorizing that is currently enjoying a burst of popularity puts the emphasis on the speaker-and-talker and hearer-and-listener. These investigators are stressing the importance of CONVERSATIONAL ANALYSIS. Conversational analysts concentrate on aspects of language other than form, grammatical function, and meaning (i.e., on things other than noun phrases, subjects, agents). Instead, they stress that the speech act is the crucial category. They, therefore, study what Goffman (1959) calls FACE WORK, the expression of solidarity, the gaining and saving of face, the maintenance of conversational floor, the negotiation of turns, and frontstage versus backstage exchanges (Esau 1981). In this sense, spoken language is quite different from written language; reading is not the same as acting out verbally. While the exchange of propositional information is doubtless important, it is not prototypical language behavior. From earliest childhood on, our language experience is interactional and multipolar; monologue is restricted almost exclusively to the rather atypical world of the classroom, lecture tours, government, and the stage. Most humans rarely practice it. Nevertheless, we are forced to deal mostly with utterance objects in this book, because there is at present no real alternative within linguistic theory of an articulated proposal despite some promising beginnings.

There is finally the perspective of language as the product of humans in large groups. These linguists study phenomena such as PIDGINS and CREOLES, LANGUAGE ATTITUDES, BI- and MULTILINGUALISM, and LANGUAGE PLANNING. Through the work of sociolinguists such as William Labov (1972a, 1972b), much has been learned regarding the influence of PRESTIGE in language variation and change. People tend to speak like those they admire. Moreover, this linguistic envy may be overt admiration for a group of leading citizens, the upper class, the educated class, or those living in the capital city of a country. The admiration may, however, also be covert, e.g., imitation of lower class speech as a sign of masculinity (Trudgill 1974).

We plan to focus primarily on language as utterance objects. Nevertheless, we hope to have emphasized sufficiently that these human and social aspects of language deserve equal weight in an ultimate account of human verbal behavior even if high-level theoretical proposals are not as advanced in these areas.

1.6 Verbal and nonverbal behavior, a unity?

In a sense, this section treats a matter similar to the one above. Some approaches to linguistic theorizing regard language (verbal) behavior to be distinct from some other kinds of nonverbal behavior. At least one, however, explicitly advocates a unity. Pike (1971) argues at length that humans engage routinely in nonverbal behavior that supports and supplants speech. We can sing songs replacing some of the words with gestures; deaf people can be taught to use a sign language such as AMSLAN as their primary means of communicating; verbal and nonverbal elements can substitute one for another in some cases. In other words, verbal and nonverbal behavior evidence the same kinds of units, functions, semantic roles, and context dependency, and, therefore, should be subsumed under the same kind of descriptive apparatus.

An opposing position is held by Chomsky. He has argued in many places that human language is quite different from other human abilities. Human languages in particular have two properties that distinguish them from other forms of behavior: their richness and their manner of acquisition. If one counts the number of distinctive sentences in English, for example, this number would be in principle unlimited. While it is somewhat unclear that the nonverbal equivalent of sentences—perhaps gesture sequences—are less numerous, such seems likely. At least, it is unlikely that a preschooler without special training can effortlessly produce and comprehend an infinitude of distinctive nonverbal messages as he or she obviously does with sentences. Perhaps, the nonverbal channels are simply underexploited by humans. It is not natural for us to rely on these means so much. And, the sign language of the deaf does in fact have the requisite limitlessness so characteristic of spoken communication. There is, however, yet another sense in which verbal behavior differs in richness from nonverbal behavior. It is a characteristic of sentences to be STRUCTURALLY RICH. They can have RIGHT-BRANCHING:

(14) There's a flea on a hair on a frog on a bump on a log in a hole at the bottom of the sea.

LEFT-BRANCHING:

(15) Dad's sister's husband's brother is running for Congress.

and INTERSENTENTIAL RELATIONSHIPS:

(16) You can lift 500 pounds.

(17) Can you lift 500 pounds?

Of course, AMSLAN also has these properties, but gesturing largely fails to have them. In more recent work, Chomsky (1980) has claimed that cognitive abilities such as vision will differ from language (grammar) abilities in significant ways.

With respect to the second area, acquisition, verbal behavior seems quite unique. Chomsky has always stressed the POVERTY OF STIMULUS ARGUMENT in speaking of the uniqueness of human speech. A child is able to acquire language not by stimulus and conditioning from the sentences heard. Very soon after the onset of speech the child will produce sentences that were NEVER heard. A Skinnerian model of language acquisition is clearly inadequate to account for this striking occurrence.

This question will be discussed again in the appropriate place. In summary, however, it seems to us that these two approaches are emphasizing different types of things. Specifically, Pike looks at the large manifest units of verbal and nonverbal behavior seeing the doubtless parallels, whereas Chomsky stresses the microscopic and technical dissimilarities. The scope of the observations is certainly part of the competing world views involved; the interests are simply different.

1.7 Formal versus functional models

In the last ten years or so, there have been some noteworthy developments in linguistic theory in reaction to a natural language being only a collection of well-formed strings (sentences) and ignoring the function of such strings within a larger discourse or context. Considering languages to be only collections of well-formed strings is to deny that a natural language has any communicative function. A group of linguists such as T. Givón, P. Hopper, S. Thompson, and others in the neofunctionalist camp have been emphasizing that the communicative function of language isn't sufficiently considered in approaches concerned only with rules of sentences. As they might say it, some substantial structures are determined or codetermined by discourse features. For example, the constraints on the distribution of aspect- and tense-marking in sequences of sentences must refer to textlinguistic patterns of organization and cannot be analyzed solely in terms of the structure of a single sentence. Moreover, there are rules of discourse organization such as Longacre's concept of PEAK, often corresponding to the point of highest tension in a discourse, that must refer to all the

sentences within a discourse. Both of these topics are considered in detail in §3.6.2.

While the functional orientation is especially clear in some specific models (see especially the discussion in chapter nine), it should be stressed that Tagmemics (see §1.6, and chapter three) and stratificational linguistics (especially in the Fleming tradition, see chapter four) both make significant use of this notion as well.

It is a commonly held assumption that the purpose of language is COMMUNICATION, and it is this position that lies behind functional models of language. Given such an orientation, the motivation and explanation for various linguistic facts is sought in text structure above the sentence level (where it is assumed that factors involving information structure influence the organization and the sorts of syntactic structures found) and in various interpersonal pragmatic patterns of behavior (especially conversation, cf. §1.5). For example, the article by Hopper and Thompson (1980) demonstrated that the linguistic category TRANSITIVITY could be motivated from its USE in a sentence.

By contrast, there is another view that emphasizes the formal properties of sentences over their functional properties. Chief among these is transformational-generative linguistics in its various forms. While formal linguists do not deny the importance of function in influencing the linguistic forms which are found in a given instance of language, they do take the position that there are formal constraints and rules independent of considerations of textual organization. They would agree that language is commonly used in a social context, and that it has a pragmatic function, but they would argue that to look ONLY at the pragmatic functions of language is to miss important organizing forces in natural languages. Formal theories commonly take the position that the goal of linguistics is to account for the facts of language acquisition, and that it is the definition of the formal characteristics of language, and the attributing of the knowledge of such characteristics to the language acquisition capability of human beings, which makes language acquisition possible.

Two sorts of facts may illustrate the discussion here. First, note the following examples:

(18) a. *John ate dinner after he went home.*
b. *After he went home John ate dinner.*

(19) a. *He ate dinner after John went home.*
b. *After John went home he ate dinner.*

Clearly the (a) and (b) sentences in each pair represent alternative manifestations of the same syntactic structure. We note further that in each there is a noun (*John*) and a pronoun (*he*) which agree for the features of person, number, and gender. We might expect that discourse factors play a role in determining for sentences like these whether the adverbial clause or the main clause occurs first; or viewed from another perspective, we might expect that the alternatives have slightly different semantic interpretations in terms of focus or relation to surrounding linguistic context.

But there is an important fact involved in the sentences in (18)–(19) which has nothing at all to do with text structure or pragmatics, and which is of a purely formal nature, true—presumably—for all languages for all time. Note that in (18a) the pronoun *he* may refer either to *John* or to someone else in the context. The same holds also for (18b), and again for (19b). But (19a) is different; the pronoun *he* cannot refer to *John* but must in fact refer to someone else. That is, the difference in (19a) and (19b) is not a function of discourse or pragmatic considerations, but simply a function of formal grammar. In particular, it is proposed that if pronominal forms like *he* are to find their reference within the same sentence, the NP to which they refer must either precede the pronoun (as in (19b)) or be in a main clause to which the clause containing the pronoun is subordinate (as in (18b)), or both (as in (18a)). In (19a) these conditions are violated, with the result that *he* cannot refer to *John*, but must find its reference elsewhere within the larger context. What is important to note here is that this difference is not a function of text structure, pragmatics, or information structure, but rather a function of the nature of the structure of sentences; by focusing on the formal characteristics of languages, such universal constraints on the possible forms and possible interpretations of natural language structures become clear, a result which is not likely if formal properties are ignored.

Take as a second example patterns like those in (20) (again we use examples from English, but the proposed account is claimed to be universal):

(20) a. *John saw him.*
b. *John saw himself.*
c. *John said that Bill saw himself.*

We know three things immediately from such sentences: in (20a), *him* cannot refer to *John*; in (20b), *himself* must refer to *John*; in (20c) *himself* must refer to *Bill* not *John*. But once again, these constraints on

coreference are not in any way related to text structure or pragmatics, but rather result as a consequence of the formal properties of languages, in particular the relationship holding between the noun *John* and the pronouns in the three sentences. In each of these instances, the relationship between the nominal in subject position preceding the verb and that in object position following the verb is one of C-Command coupled with the notion of binding (the nominal subject position binds that in object position, see chapter five). Reflexive pronouns must be bound within the simple clause, nonreflexive pronouns must not be. Thus, *him* cannot refer to *John* in (20a) (because then *John* would be binding *him*), *himself* must refer to *John* in (20b) (because otherwise it would receive no interpretation), and *himself* in (20c) must refer to *Bill* not *John*, because *Bill* is the closest subject and, in fact, the one within the minimal clause in which *himself* occurs. But once again, there is no account of such facts outside the domain of the simple sentence itself, much less the context of a full discourse or a pragmatic speech situation.

Formal approaches, then, insist that there is value in studying the formal properties of languages, because by defining such properties, it is possible to identify constraints governing languages which then can be attributed to the hard-wired innate language acquisition capability of human beings, thus providing a beginning understanding of how language acquisition becomes possible.

One way to characterize the opposing view of functionalists versus formalists is that functionalists might say that in describing grammar at all levels, whether concerned with discourse, sentences, phrases, or some other category, that there is only one "grammar" and grammar is determined by function. The formalists, on the other hand, might say that there are basically two "grammars" to discover: one to organize the computational-representational aspects of language and one to organize the functional-informational aspects of language. The choice between these two views continues to be debated with the outcome still uncertain.

2

The *Aspects* Model

We have picked Chomsky's *Aspects* model (1965) as a point of departure for the discussion of linguistic research traditions even though it is not chronologically the earliest of the proposals we intend to report on. It occupies this position as point of reference because supporters and nonsupporters all agree that it and its successors have had the most influence on the greatest number of linguists. Moreover, in this work, Chomsky explicitly pleads for a particular research logic and is quite concerned about methods. As already stated, the presentation of this model and subsequent models as well first center on the general aims, methods, and philosophy before moving on to discuss the specifics of individual theories. The final area to be discussed is the problem-solving capacity of a particular approach. Because we feel this particular feature of a theory needs illustration, we have chosen the English auxiliary system as an example to be used in the discussion of each theory. We note, however, that the details of the treatment are not to be regarded as adequate in the empirical sense. In many instances, advocates of a particular position might reject them partially or totally. We are more interested in the manner of presentation, kind of evidence, methods of argumentation, and interests than in the validity of the specifics.

The book *Aspects of the Theory of Syntax* (1965) is reputed to have been written in a few short weeks. Whether this is true or not, it bears the marks of a piece composed in the heat of discovery. Important points or points that became important are found in footnotes. Judged even by today's standard, there are paragraphs still demanding exegesis and interpretation. Nevertheless, it has probably sold more copies than any other linguistic book to this day. The current editions of the paperback exceed twelve. It is divided into four chapters: METHODS, THE BASE, THE TRANSFORMATIONAL COMPONENT, and RESIDUAL PROBLEMS.