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INTRODUCTION
SEMANTICS DEFINED

The word *semantics* is derived from the Greek *semaino,* meaning, to signify or mean. Semantics is part of the larger study of signs, semiotics. It is the part that deals with words as signs (symbols) and language as a system of signs (words as symbols).

HISTORICALLY, THE SEMANTIC EMPHASES OF PHILOSOPHERS AND LINGUISTS

Plato, in his Cratylus dialogue, discussed nouns as "names" -- for persons, objects, and, to some degree, actions (Jowett, 1875). Although naming is a basic, primitive, and necessary speech act, necessary for communications, it does not encompass nearly all of what words do and mean. Most simply understood, words are symbols (nouns, pronouns, adjectives, verbs, verbals, and adverbs) representing objects (concrete or abstract), actions (physical or mental), or qualities (which may be called attributes, properties, or features), or they are symbols (prepositions, determiners, demonstratives, or conjunctions) that refer to the relationships among those entities.

Moreover, words used in various contexts change meaning and evoke different responses in those who hear or read them. In fact, the English Renaissance philosophers Baconand Hobbes were keenly aware of the uncertain dependence of words upon human perception. In sections 38-44 of his *Novum Organum* on "the idols of the tribe," Bacon spoke of the human being's innate inability exactly to match the mirroring mind to the object of its concern because of the limitations and fallibility of sensory perception. He also noted, in the same essay, that the individual's perception is conditioned by the extent and kind of his own learning and experience, that public opinion too has an effect on one's perception and one's way of expressing it, and that current philosophies (accepted, learned modes of belief) also structure the way one sees the world (Burtt, 1939). And Hobbes, in *Leviathan* (1651), spoke of "inconstant naming"; for example, what one man calls "cruelty" another may call "justice" (Hobbes, 1965, pp. 37-38).

In 1690, in his *Essay Concerning Human Understanding,* Locke explored the connections among perception, thought, and language more fully than his predecessors. Locke perceived the physical world as composed of various basic kinds of things, what he called "essences." The corporeal substance he called the "real essence" and the idea of it the "nominal essence," which was "nominal" because it would identify the corporeal by its name. Locke developed the theory of mental association as the basis of human thought, and, in the process, Locke also pointed out that we know the distinct nature of an object by differentiating it from other objects, that our

ability to define rests on our ability to see what one thing has that another thing lacks and vice-versa (Locke, 1965, pp. 50-53).

The 18th-century German philosopher Immanuel Kant, too, recognized the difficulty of appropriate and precise naming of objects in our phenomenal world. Human perception, after all, is subjective and individual. At the same time, he also recognized the valid workability of the scientific method (Bacon's key contribution to scientific thought). What gives us assurance of a commonly grounded, therefore "objective," truth is, however, in the final analysis, our common, human function of sensory perception and our equally common method of conceptualization.

Kant believed that there were certain transcendental "categories" of knowledge to which all perceptions and their resultant concepts had to pertain. These were the grand abstractions of physics: substance, causation, time, and space. The method by which we conceptualize was also a transcendental category, that of logic. So, likewise, were the universal elements of grammar and syntax. These "categories" were the structure of our intelligence, in his view, the axiomatic truths of our existence upon which all mental activity, and therefore, all knowledge and all verbal expression of it were based. Unfortunately, because of the limitations of "categorical" knowledge we could never know the ideal, "numeral," world of which our phenomenal world was simply a reflection. The nature of what Kant called the Thing-in-itself would always elude us (Ape, 1974; Simon, 1974).

Ernst Mach, the 19th-century Austrian physicist and philosopher, modified Locke's theory of perception. He argued, in his *Contributions to the Analysis of Sensations* (1879), that there were no essences independent of human sensation, that our empirical knowledge rests on sensations, and that we can postulate no existence beyond them (Cornforth, 1965). To speak of truth then was to speak of an analysis of sensations. That which could not be analysed, abstractions such as God, Heaven, and Eternity, and Kant's Thing-in-itself could not be said to be true or even, in the scientific sense, to exist.

Other philosophers, the Platonic Idealists such as Bishop Berkeley in the 18th century and F. H. Bradley and William James in the 19th and early 20th centuries, also made the point that we know our physical world through the sensations, but they allowed for kinds of knowing other than the empirical and granted to the knowing of intuition, revelation, and the awareness of different psychic states a state of truth that would be an anathema to scientists such as Mach.

To the "realist" philosophers of the early 20th century, paramount among them being Bertrand Russell, the study of language should concern itself only with what is probably true. Mathematicians such as Russell and his German predecessor Gottlob Frege sought to explain the connections of meaning to perception, in Frege's terms, "sense" to "reference," and to create a calculus of language that would symbolically explain how it works in creating our understanding of the world. Russell converted sentences into propositions of truth and worked out sets of formulae that showed how different propositions logically relate to one another. Matters of truth and logic were of more importance than the meaning of words per se to Russell.

The same may be said of the Logical Positivist Rudolf Carnap and of the language philosopher Ludwig Wittgenstein.

Carnap, a one-time student of Frege's, evolved a set of propositions designed to show the relationship of abstract thought to sensory observations. He confined his study of the hierarchical connections of thought and language to concepts that could be verified in physical experience. For purposes of his analysis, he completely discounted the "truth" of value judgments and metaphysical beliefs.

Wittgenstein, who was, along with Russell, one of the founders of English linguistic philosophy, said, "Philosophy is the activity of clarification of language by logical analysis" (Baker & Hacker, 1984). In his *Truciatus,* he attacked metaphysical propositions as false, therefore, not worthy of investigation.

By 1925, semantic theory was still in the hands of the philosophers. It had progressed from being a matter of "naming" to being a matter of "truth." It was no longer focused on words as individual entities but on words as they are used to express propositions. Unfortunately, the propositions themselves were restricted to matters of fact; attitudes, desires, motivations, and value judgments were all excluded. Feelings and beliefs could not be scientifically verified, so they were dismissed as not true. The language that expresses these subjective impressions was also left unanalysed. The semantics of the "realist" philosophers and truth theorists was only a partial semantics at best. In their passion for a grounding in physical reality and attachment to scientific observation and verification, they were like the Behaviourist school of psychology, led by John Watson in the United States in the 1920s and 1930s: bound to believe in the existence only of what they could verify with physical precision, they not only omitted half or more of man's conscious experience but, by not considering its relation to the other half, they distorted the truth of what they did investigate. As the champion of a more encompassing truth of existence, Karl Jaspers, said, "Truth is infinitely more than scientific correctness" (Jaspers, 1956, p. 148).

Fortunately for the preservation of meaningful communications throughout the language, the lexicographers continued to carry forward in their dictionaries the English vocabulary with its inevitable changes in use, and, therefore, in meaning. Since Dr. Johnson created his idiosyncratic dictionary in l8th-century England, lexicographers have relied on the historical study of word changes, that is, etymology, and on surveys of word usage-how, when, and where words are actually used and with what apparent meaning. Today, lexicographers rely on input from many disciplines, ranging all the way from dialectology to medicine and law. The basic compendia of English words, *The Oxford English Dictionary* and *Webster's Unabridged,* remain grounded on the actual use of the language, including all words that have some sort of meaning to those who use them, even if what they state cannot be verified by the methods of the physical scientist. The lexicographers preserve the language while the truth theorists, logicians, and linguists dissect and analyse it to determine how it functions. When the analysts become too partial to their own views and too restrictive in their formulations, their readers can return to common sense by opening their dictionaries. Language is larger and more solidly human than any formula can make it.

How words are used, their context with other words and their context in terms of the physical situation in which they are uttered has much to do with their meaning. Frege recognized that words have certain senses of meaning that could vary according to the "force" of the utterance, that is, the situation, the intent of the speaker, the state of mind of the hearer, and so on. Since Frege's time, the study of such matters, now known as Pragmatics (in its physical manifestations) and Intentionality (in its mental ones), has helped to broaden semantic theory and keep it from being oversimplified by the truth theorists, logicians, and linguists.

This is not to say that the logicians and linguists have not contributed greatly to the field. Predicate logic, developed from Frege, illustrates the logical relationships of entities named in a sentence in terms of classes, their members, and their relationships. The symbolic logicians' work, stemming from the set theory of Giorgio Peano and the algebra and propositional calculus of an earlier 19th-century mathematician, George Boole, gave us Russell's propositional logic and a still developing logic of quantifiers and classes. Their Formal Semantics, also called "set theoretic semantics" (Martin, 1987, p. ix), is a logic expressed as symbolic propositions that include and exclude each other entirely or in part, Propositions are, by definition, true statements, so truth and falsity are a major concern in this form of semantics, and truth tables are used to show how true and false statements may combine to make other such statements.

Formal Semantics also deals with conditional propositions of the "if -- then" type and the "it is necessary that. . ." type. Matters of "some," "all," .a," "any," "every," and other such quantifiers are treated symbolically in formulations that reflect their general and particular senses and usages.

All formal semantic propositions can be expressed in words. The symbology is merely a short-hand for such expression. Facility with this logic, however, requires the study of its symbolic presentation, and it has more appeal to the mathematically inclined students of semantics than to the more strictly language-oriented. It can be a useful tool in analyzing the logical base of linguistic expression and is constantly being expanded. The expansion, however, entails the development of more and longer formulae for rules of expression. There is a tendency among the most theoretical logicians, Quine, for example, to analyze and develop the formulae apart from the language on which it is supposedly based. The tendency toward formal abstraction, then, makes the extended form of this logic less applicable to actual discourse and somewhat questionable, filled as it is with unapplied (untested) assumptions about certain types of linguistic statements.

The largest group of scholars who have contributed significantly to the development of semantic theory in the 20th century are the linguists. Up to 1950, with the work of Leonard Bloomfield, most structural linguists took a behaviorist's view of language. Bloomfield and others studied the way it was spoken and separated out the language into units of sound and apparent meaning, developing a sophisticated system of phonetic notation in the process. The meaning of words was based on the responses of hearers. The method was well suited to anthropological studies of "primitive" peoples and their languages and to studies of word formation and word acquisition, although more cognitive anthropological linguists, notably Sapir and Whorf, eschewed its limitations. It left out matters of perception, neglected the study

of words as grammatical systems and syntactic networks, and in its emphasis on breaking down the language into its most discrete sound units, phonemes, it largely left the study of word meanings in civilized discourse to the lexicographers. Historical linguists, however, did continue to study the changes in the language over the centuries and, in the process, were often quick to note the political and social influences on word change and development.

With Noam Chomsky's work at MIT in the 1960s, traditional grammar was subjected to fresh scrutiny, and Chomsky developed an alternative -- generative grammar. His grammar purportedly explained how we develop sentences. Unfortunately, the grammar had, at first, no semantics. Chomsky and others eventually turned their attention to such questions as: Why do we choose the words we do? Why is it that only certain adjectives or nouns can be used with certain other nouns? How does the choice of verb limit the choices of adjectives and nouns that follow it? And how does the mind make these selections? A *propos* of the last question, Chomsky concluded that we have a genetically developed process of symbol organization that allowed him to assert that there is a "deep structure" under the apparent surface structure of grammatical utterances. This deep structure becomes surface structure through a set of transformations that are part of our mental ability to ramify simpler thoughts into more complex, individuated expressions. This approach allowed Chomsky to base his generative grammar on the basic, although largely unexplained, nature of the mental process. It also necessitated the consideration of different noun and verb classes and their differentiating qualities or features that enable word selection.

Jerrold Katz, around 1970, developed in his generative semantics a system of semantic marking that explained, to some degree, the mental process of selecting various words and word order as we speak or read. With Katz's work there has been a great deal of discussion of the way word "features" work to promote the proper selection of words in our discourse. Later, Charles Fillmore, using a features approach, proposed a "case grammar," in which he used a more extensive word feature classification system than had heretofore been used in generative grammar. The possibilities and limitations of the features approach are still being explored.

With the recognition that the use of words depends on their meaning and that grammar ultimately depends on semantics and the mental process of conceptualization, there has been an increased interest in phenomenology as well. Once again using Locke's *Treatise* as a point of departure, phenomenologists, notably the 20th-century philosopher Edmund Husserl, have used and gone beyond Locke's concept of "essences" and primary and secondary qualities of perception to a more intensive investigation of how we perceive time, space, and qualities of light, sound, and other sensory elements. Husserl (1973) saw truth as intersubjective, although, like Kant, he believed that the objective world is there for us to perceive; it is in his terms the "pregiven," there but subject to the distortions of human perception. The phenomenologists show how dependent words and their meanings are upon immediate and remembered perception and just how subjective "meaning" is.

Just how we go about selecting words to express our perception of things past and present is a central focus of current research on artificial intelligence. In related reaction time studies there have been some confirmations of features analysis selection, a favorite subject of Fillmore and

other case-grammarians. How do we order our vocabulary in deep structure? How do we index it so that we can recall the word we need in minimal time? These are two of the major questions that intrigue the artificial intelligence researchers.

In what has been said thus far it is easy to see that semantics enters into a number of areas of research. This is all well and good, for the subject is not so simple as Plato treated it, certainly, and specialists in perception, grammar, etymology, phonology, and so on all have something to contribute. The problem for the semanticist, however, is that this dispersal of the subject into various specialized fields has left it without a unified focus or purpose.

THE FOCUS OF GENERAL SEMANTICS

The founder of general semantics, Alexander Korzybski, used a psychosociological approach to the study of words to keep the larger focus on communication and thought. In his *The Manhood of Humanity* (1921) and *Science and Sanity* (1933), he emphasized logic in actual argument, the subjective nature of truth and perception and truth as a matter of degree, the effects of history on the meaning of words, and language as the key to imperfections in human thought.

In this book we will consider the subject of semantics as a discipline in itself, one that utilizes the research done in various allied disciplines but one that can, in the final analysis, stand for itself in both its theoretic and applied aspects. The purpose of the book is to introduce the reader, the nonspecialist, to the most important aspects of the study of semantics, ranging from the study of human perception to word formation and artificial intelligence.

The penultimate chapter is a survey of topics currently under study by general semanticists. This chapter can be of use to students interested in writing a paper on semantics, in that it suggests viable topics and also provides useful references. Also, as an aid to the student, questions and suggested exercises are included at the end of every chapter.

THE PLAN OF THIS BOOK

As Locke and Kant realized some centuries before our time, words are signs for mental concepts. To understand how words signify, we must understand the process of conceptualization. The first two chapters describe the nature of the process with its attendant problems of subjective truth, relative awareness, unanalyzed association, and poorly grounded and overreaching logic. The relation of semantics to logic is also explored and defined.

Russell, Wittgenstein, Carnap, and other truth theorists saw semantics as the study of the expression of verifiable, logical truths of our physical existence. The third chapter deals with the use and limitations of truth theory in semantic matters and what word meaning entails beyond truth and logic. In this latter connection, taking its cue from Frege, this chapter also outlines the role of Pragmatics and Intentionality in determining word meaning.

Chapter 4 is concerned with the word itself and how its related concept is defined. How are words created, transformed, and changed by use? What are the morphemic processes that enable

us to enlarge our vocabularies and also enable us to use words and parts of words in different syntax? A word is always a sign for something. It always has meaning, but how do we ascertain it? What are the methods and difficulties of defining words?

Chapter 5 is concerned with the semantic connection to grammar and syntax. Words are strung together to make meaningful statements. Their syntactic arrangement is, in part, determined by their individual meanings, and their meanings are modified by the arrangement. With reference to Katz, Fodor, Fillmore, and other semantic linguists, the semantic basis for grammatic categorization and word order dependence are explored.Chapter 6 deals with the way word meaning is expanded through metaphor and its associated comparative figures of speech, whereas chapter 7 analyzes paradox and other contrastive figures of speech.Chapter 8 looks at the contributions of artificial intelligence (AI) to the study of semantics and tries to answer the key question: Is there a semantics for Al?The ninth chapter is a bibliographical one that discusses key articles appearing in the chief journal of general semantics since the mid-1980s as a means of showing what subjects and types of studies are of interest to general semanticists.Chapter 10 is a brief summary of the text and a statement in favor of considering semantics as an independent discipline.

INTRODUCTION DISCUSSION QUESTIONS

1.Aside from naming, just what else can words do? In what sorts of situations?

2.How does the lexicographer's approach to language differ from that of the language philosophers and the structural linguists?

3.What do these differences suggest about the usefulness of the dictionary definitions of words?

4.Why is the attempt to make the study of semantics into an exact science probably doomed to failure?

5.How does general semantics add a practical dimension to the study of word meanings?

CHAPTER 1
KNOWING AND MEANING

How do we know the meaning of a word? To answer that basic question we must examine the way humans convert their experience into thought and words. To what extent do words condition our thinking? Let us address the first question by a direct consideration of conceptualization and the second indirectly with a consideration of the Whorf "linguistic relativity" hypothesis.

CONCEPTUALIZATION

When we say that we know the meaning of a word, we are saying that we can relate that word to some object or action or to its attributes and/or to some class of objects, actions, or attributes. Thus, "house" refers to either a particular object or class of similar objects that we call "houses," "going" refers to the motion of some object, "white" refers to the color of some object, "rapidly" to some movement, and such words as "in" and "the" and "that" are words that help define the relationship of objects or actions to one another, objects or actions to attributes, and classes of each to themselves and to each other.

Words are symbols and have no meaning in themselves. What they mean depends on the connection between them and our perception of things, what they stand for in our experience both immediate and recalled. The meaning of a word such as "ball" can be more complex than such a simple object would at first suggest, and the meaning of an abstraction such as "America" can defy ready definition.

How do we know what an object is? In the words of the well-known language meaning theorists Ogden and Richards (1989), "To say that I recognize something before me as a strawberry and expect it to be luscious, is to say that a present process in me belongs to a determinative psychological context together with certain past processes (past perceptions and conceptions of strawberries). These psychological contexts recur whenever we recognize or infer" (p. 57).

Let us explore this process in detail. How do we know an object is a "ball"? As youngsters, perhaps we were allowed to toss and bounce a spherical object that our parents called a "ball," and whenever we wanted to play with it, we had to ask for it by pronouncing the word "ball." The first time we saw a volleyball perhaps we did not know what to call it. It was so much larger than the ball we played with that we could not make the word connection. And when we heard our brothers call an oval object a "football" and were told to get the "ball," we were surprised because it did not look like a ball at all. Perhaps one day a father rolled up a piece of paper off his desk and tossed it into the wastebasket and one of us said, "I'll get the ball," and tried to pull the wad out of the basket. The father might have been perplexed as to why his son should think that was a "ball," but the son had learned that that which is roughly round and thrown is a "ball." A round rock too? Maybe, but the son might hesitate to call it that because it is compressed and heavier for it size than anything called "ball" that he had known. Words, then, are symbols for concepts arrived at through experience. If an object fits the concept, then the word that is the symbol of the concept may be used to signify the object.

Now, although this commonplace mental activity is necessary for us to develop a vocabulary and to choose words to communicate with one another, it is subjective in nature, so that unless the past experience of the communicants is the same there are likely to be cases where the meaning of a word to one is not the same as it is to another, as in the case of the son and father with the paper "ball."

Moreover, how much more difficult it is to match meanings on a word like "America"! Once one gets past the most factual part of the definition America's location, when it was discovered, its population and size, and so on-that person is faced with a plethora of impressions that the word makes upon its speakers and hearers, impressions of patriotism, destiny, wealth, freedom,

opportunity, and the like, all in various degrees, depending on the individual's own experience with the country in its various regions and economic and cultural groups. These impressions are far more the meaning of the word to most Americans than the bare facts of America's existence, Likewise, this is true for all words that represent concepts that include a heavy burden of value judgments and thus have a great power of evoking emotions.

Knowing what something is in cases of complex relationships is seldom an either-or proposition. Korzybski (1921, 1933) made this point repeatedly in his two books, *The Manhood of Humanity* and *Science and Sanity*. More recently, Fillmore gave us the example of colors in this connection: ". . . to know red1 is to know something more or less directly, but to know *pink* is to know *red*[1] and to know that pink differs from red along a certain dimension and to a certain degree . . ." (Fillmore, 1972, pp. 55-56). The key word here is "degree." When we say that we know what a "ball" is or what "America" is, we are speaking of the concept to which the word is related and saying that we can describe the object referred to (the referent) so that most people would agree with the accuracy of the description and thus that their concept of the word is the same as ours. But once the general factual description is completed and we begin to deal with less known facts and with our own impressions of the object, we are less apt to find agreement. So, along a continuum from red to white, some people would find *pink* covering one part of the continuum while others would find their own areas of coverage overlapping but having different limits. And in the case of *America* as a land of opportunity, the degree of opportunity would be defined differently by different socioeconomic groups, so that, for some, the word "opportunity" would need radical modification.

To further complicate the matter, not only is knowing the meaning of a word relative to one's own subjective experience, but the act of knowing is itself a matter of degree. We may hear a bell, for example, and know that it is a bell but may not know what it signifies. We are aware and are able to recognize the sound, nothing more. It is also possible for the bell to ring, according to someone else seated next to us, and for us not to be aware of it because our attention is on other matters.

How do we know what stimuli to reject and which ones to accept into consciousness? Almost immediately upon sensing some stimulus that stimulus would have to be classified. And in fact, speed of association tests do suggest that this is what takes place. In a test done by M. C. Patten in the 1970s it was shown that subjects' identification of rapidly shown cards was almost equally improved by giving the subjects advanced information as to the class of the object to be shown as it was by giving them in advance a picture of what would be presented (Klatzky & Story, 1978). The only way either of these advance presentations could be of value is for them to have been installed in the subjects' minds as ready associations for the test. In the case of the conceptual association, because the response had to be immediate, the test strongly suggests that immediate conceptualization is exactly what happens when something is first perceived.

Node excitation in computer simulation of neuron brain activity has demonstrated the associative, hierarchical pattern. "The level of activation of higher nodes is determined by how closely they match, and how closely their subpatterns and superpatterns match, and how closely alternative patterns match" (Anderson, 1983, p. 32). The computer simulation developed by

Anderson and other researchers (ACT) is goal-driven, as is the human attempt at recall or our attempt to understand a process, and exhibits not only a hierarchical structure but also "the strong seriality in the flow of human cognition" (p. 33). The hierarchical, classificatory, structure of our thinking also enables us to retrieve facts, allowing the spread of node activation to be limited and focused.

Once the stimulus is recognized as an entity with certain attributes that make it a member of a class of things with similar attributes, there must be a further classification of this now conceptualized stimulus as being either important or unimportant to the immediate desires and needs of the person concerned. Attention is given to those stimuli that further a desire or pose a threat. Once classified, and this is automatic and subconscious, the degree of importance of the incident for the current situation is assessed, and the incident is either brought to consciousness for fresh consideration or rejected and dropped into subliminal memory, from which it may be recalled later consciously or perhaps in dreams or under hypnosis.

Classification may be conscious or unconscious, but a great deal of classification is habitual and is predominantly unconscious, although there may be some flickerings of conscious awareness connected with the process. For it to be unconscious, however, suggests that there is no need for conscious deliberation for the recognition and identification of the stimulus and awareness of its relation to feelings of desire and threat. For example, a driver, daydreaming while performing the daily commute to work, will not be conscious of many of the cars around him, but should someone ahead of him suddenly hit the brakes, he will probably respond by hitting his own and will allow the reality of cars, lights, and road ahead to cut off the daydream. One second, other cars are just *cars* and, the next second, they are *cars as threats,* recategorized instantaneously into a priority category[2] demanding conscious attention to other individual vehicles and immediate decisions regarding one's own.

We have, then, a classification process that has been made habitual through experience, but whenever experience fails to fit the existing categories, the need we feel to decide what it is, and, therefore, what it entails in its object attributes and relationships, prompts conscious thought and the conceptualization of new categories of experience, not by themselves but as part of a hierarchical process of generalization. This process develops new conceptual knowledge, and as it does so, it expresses new relationships between the new concepts and the old. It also develops language as we attach symbolic labels (words) to the new concepts. One might add that in finding or, in some cases, creating new words for items of experience that do not quite fit existing categories, we have also set limits to the perceptions that can be related to the pre-existing concepts, thus redefining them and their attendant labels (words).

UNCERTAINTY OF PERCEPTION AND MEMORY

To know what an object or event is, we have to deal with the problem of the essential subjectivity of perception and, in doing so, with the different scope and intensity of conscious awareness under different circumstances in individual perceptions. How consciously we know something will determine how we define it. If it is something that we habitually see and know in its various forms, we can probably say that we know that it is a "dog," "table," "chair,"

"house," or whatever, without even thinking how generalized these terms are. If we designed the house or built the chair or owned the dog, we would know many of the particulars that would set apart this specific house, chair, or dog from the classses of things described as "house," "chair," or "dog." We would have made many conscious contacts with these things, made decisions concerning them, and would have treated their physical parts and functions in many ways very consciously. Our relationships with these objects will have conditioned the way we regard the whole class of such objects and, therefore, may well make our definitions of "house," "chair," and "dog" more particularized and somewhat different from those of other persons. And certainly, if the only dog a person ever owned was always biting people and getting into dog fights and running up enormous veterinary bills, that person would be apt to define "dog" differently from one who had merely patted and fed stereotypical Fidos.

There is also the problem of memory. Human memory is notoriously inexact. We keep records, letters, and books, not to mention cassette tapes, films, and heirlooms in order to re-experience and recollect. Even with these prompts we often cannot recall experience in detail. Our word descriptions of past events are apt to be inaccurate and vague.

Western civilization has attempted to overcome memory's fading and blurring with its written documentation of experience and its insistent indexing by calendars and clocks. Primitive societies that long lacked a written language have relied on the carefully tutored memories of their scops or storytellers to pass down their history, traditions, and mythological lore to succeeding generations. The storytellers cannot be exact as to when an event occurred, however, because these societies have not kept calendars, and, in fact, their mathematics is often limited to the addition and subtraction of a few things of their everday experience. So the Indian, when asked about the time of the event, may answer, "Many moons ago," when the event occurred not merely months ago but, perhaps, 100 years ago.

The inexactitude of memory and the habits of perception and conceptualization within a culture, its tendency to remember events in certain way, as the Indian does time in terms of moons, builds a certain content in the language of the culture and makes habitual certain forms of expression.

LINGUISTIC RELATIVITY

In his studies of the Hopi, Whorf (1956) noted that their language has a plethora of verbs but only three tenses. According to Whorf, tomorrow for the Hopi is the reappearance of today. Time is a continuation out of the darkness of a distant past into a distant future equally dark, the only known state being a continuing present. In expressing motion, the Hopi says that something in motion has "begun to move," and when the motion stops, it has "begun to move begun to move." In Western physics we speak of a static object as having *potential* (as opposed to *kinetic*) energy, and to the Hopi, apparently, there is no real staticity, always instead a sense of change and continuation. This fluid sense of time allows them to speak of the known past as part of the present, of the day-to-day future as repetition, and to use a general tense to convey timeless action.

Whorf's point, semantically, was that language is representative of a mode of thought peculiar to the people that use it. The corollary is that the meaning of words is culturally dependent, and translation between cultures does not permit word-for-word substitutions or even word-for-phrase/phrase-for-word substitutions that are exact correlations of meaning (Whorf, 1956).

Since Whorf's work (1930-1956), other anthropological linguists have made more controlled studies of American Indian cultures. Malotki (1983) attacked the often self-contradictory Whorf on several points: He showed that, contrary to one of Whorf's statements, the Hopi do use spatial metaphors to express time, in their words for "on," "against," "end," "length," "lapse," "arrive," and others (p. 14). He also found "a direct equation of the noun *qeni,* 'space,' with the notion of time" (pp. 15-16). Moreover, the Hopi, using the metaphorical time sense of "approach" could convey an imaginary time-space such as one might find narrated in a story. However, any period of more than 4 days is "extreme" and usually not counted out. One may assume that periods of much longer duration are not counted out in days at all. And when it comes to dividing up the day into hours, the Hopi never did it until the White man came, and then, in order, to convey the concept, they relied upon the hour hand of the clock, so an hour is qoni, "he turned around" (p. 207).

Malotki spent much time refuting Whorf's claim that the Hopi count only in ordinal numbers. Whorf said that the Hopi counted a group of items as having so many repetitions of an item (or manifestation) having certain properties. Malotki interpreted certain instances of counting as totals, with the Hopi using what is meant to be cardinal numbers. He claimed to have refuted Whorf's assertion that "our time' differs markedly from Hopi 'duration' " (p. 631).

Whorf's understanding of Hopi time is certainly ambivalent. He stated, on the one hand, that the Hopi have no concept of an ever-flowing time. They supposedly have, instead, a sense of forms being "manifested"or "manifesting" (Whorf, 1956). On the other hand, time for the Hopi is never a specified interval with beginning and end boundaries either, but always a "getting later" (p. 143).

Hopi is a verb-dominated language with only three tenses. Whorf believed that "users of markedly different grammars are pointed by the grammars toward different types of observations and different evaluations of externally similar acts of observations, and hence are not equivalent as observers but must arrive at somewhat different views of the world" (Whorf, cited in Lucy, 1992b, p. 38). The question posed by these differing views of Hopi time and its expression in language is whether or not the Hopi reliance on verb forms and limited tenses really does preclude their understanding of time, in its various manifestations, in the sense of western European cultures without their being taught to do so by one of those cultures.

Wierzbicka (1991) pointed out that in many cases the lack of an exact correlating word, as in there being no pronouns usable in certain Japanese expressions that would call for pronoun use in English, does not mean that there is not a correlating expression, using, for example, Japanese honorific verbs, instead of directly saying "I" or "you" (p. 12).

Lucy (1992b) questioned the results of a number of cross-cultural studies which he sees as biased by English-speaking researchers because they judge the results of tests by English language norms instead of using some sort of neutral criterion. His books, *Language Diversity and Thought* (1992b) and *Grammatical Categories and Cognition* (1992a), show the difficulty of proving the Whorf hypothesis in adequately controlled studies.

Lucy (1992a) developed the hypothesis that if the grammar and vocabulary of a language show a tendency toward some perceptual expression as opposed to others that this does show some cognitive tendency as well. So he said, "Since the Yucatec speakers do not pluralize Type A [-animate, + discrete] noun phrases at the same *absolute* level as do English speakers, they may exhibit a somewhat lower overall level of attention to number than English speakers" (p. 88). In a picture test with Yucatec and English speakers he found that "English speakers showed a greater sensitivity to changes in the number of an Animal or Implement than to changes in the number of a Substance [that is, to the number of items in this category], whereas Yucatec speakers showed a greater sensitivity to changes in the number of an Animal than to changes in the number of an Implement or Substance" (p. 135). The two languages show just these tendencies to plural recognition, so there does appear to be a correlation in the way plurality is perceived and verbally expressed in each case.

Whorf noted the specificity of action of Hopi verbs when compared to verbs in English. Navajo is even more verb-dominated than Hopi (RossiLaudi, 1973). In order to translate "I give" into Navajo, the translator must choose 1 of 20 verb forms, depending on the object to be given. In Navajo it never "rains," but always in a certain way; likewise an object can only "move" in a certain way. The Navajo cannot speak of the general action by itself and may not be able to conceive of it without training by representatives of a culture with the more general concept.

In regard to a more civilized language, Bloom's (1981) study of abstraction in Chinese political thinking led him to conclude that the Chinese have difficulty in hypothesizing because their language does not permit adequate counterfactual expression:

despite Chinese grammatical precision in expressing both the degree of likelihood of the premise of implicational statements and the distinction between if-then and if-and-only-if-then interpretations of the relationship of the premise to its consequence, the Chinese language has no distinct lexical, grammatical, or intonational device to signal entry into the counterfactual realm, to indicate explicitly that the events referred to have definitely not occurred and are being discussed for the purpose only of exploring the might-have-been or might-be. (p. 16)

Friederich (1986) noted that languages have different forms of metaphor too that prohibit the exact translation of experience. For the Grecian Sappho sleep may drop down but not for the speaker of Tarascan. The English uses of "thing" in various idioms like "to know everything" "imply an object-oriented world view." In Russian, these expressions, Friederich said, would translate into verbs "without overt objectives or with non-thing objects" (p. 32). The suggestion is that differences in the way experience is conceptualized account for differences in language which in turn promote the same kind of conceptualization and exclude others.

Whether or not Whorf was right in all his particulars of Hopi analysis (and his contradictoriness does seem to make that an impossibility), his hypothesis that language helps to form the thought of a culture in ways peculiar to that culture is holding up quite well even though well-controlled studies of the culture-language connection are difficult to organize and administer, and are few in the literature.

SUMMARY

What we mean by what we say is dependent on what we know, and what we know depends on our essentially subjective experience and our memory. Experience is conditional not on some supposedly objective time and place but on our perception of what we believe to be something at what we believe is or was a time and place. Individual human perception is dependent on its physiology, its focus, and its attendant associations of remembered perceptions and overarching concepts. We say that we "know" something when we have conceptualized our perceptions in some focal area. That process is discussed in the next chapter.

Not only is thought the basis of language but the forms language takes in vocabulary and grammar express a way of thinking that is then reimpressed on further thought. So it is that different cultures give rise to differently structured languages and that those languages present great translation difficulties in intercultural communication.

CHAPTER I DISCUSSION QUESTIONS

Diagram the process of perception from object to percept to concept to hierarchical concept and discuss the following questions:

1. What factors influence the initial perception of the object?

2. What associations (similarities and differences) pertain in your initial classification of the object?

3. What other classifications could you have used, according to what other kinds of similarities and/or differences?

4. If you referred to the object by one of its classificatory names instead of another, how would this affect the response of your audience to the object?

5. Can you explain how different classificatory systems in different languages might affect the ways that the same object is perceived by members of different cultures?

CHAPTER 2
ASSOCIATION AND LOGIC

Word meaning depends on conceptualization. How is that process instigated, and how does it translate into language? How do we reason with concepts, and what place has language in the logical process? In this connection, how is semantics related to logic? In order to answer these questions we must look at how thought is aroused and how it proceeds as thinking.

AWARENESS, KNOWING, AND CLASSIFICATION

Perception is permitted and limited by the five senses, and knowing is limited by our awareness. Knowing is also limited by our memory of previous experience and its classification as desirable, undesirable, threatening, important, or insignificant. Our memory of the past may be only a vague sense of some happening because that which is deemed insignificant is, unless associated directly with some important event, forgotten. These classifications are not conscious but are emotional effects (affects) that remain attached to recollections of the event and inspire its recollection.

Whether or not a perception is important depends on our understanding of the referent's relation to our well-being. The importance of a red traffic light in a crowded instersection is obvious, but the importance of a newspaper article about a presidential candidate's supposed love affair will very much depend on the individual reader's interest in politics, his or her morals, and his or her interest in the candidate or in news of that type. And just as our memories are affected by previous experience and its attendant affects, so too our knowledge, our ability to acquire it and to retain and use it to formulate new knowledge, is conditioned by the way we connect our perceptions in the present with those of the past.

This method is a classificatory one based on comparative and contrastive associations. These associations may be ones of form (i.e., shape, size, color, texture, and other sensory attributes such as sound or smell), of function (how the object works and to what purpose), of origin or development, and of time, place, and sequence. Once two objects are found to have some similar properties (e.g., round and capable of being thrown or kicked in a game), we are ready to generalize the particular objects into a class ("ball," in this case). We are also ready to make distinctions based on the attributes of the objects that are not similar. So, a grapefruit to a child might appear to be, possibly, a ball, but its lack of durability and mother's scolding would soon disabuse the child of that notion. Becoming more sophisticated on the subject, the child would also note that grapefruit are grown on trees, whereas balls are not. So, as said in chapter 1, with additional experience, the comparative and contrastive attributes of various objects more and more fully define the concept of *ball* and, thus, what referents the word "ball" may properly have.

In what Smith and Medin (1981) called the "classical view" of conceptualization, "one can have complete confidence in any categorization that considers all relevant properties of the concept" (p. 9). These authors, however, espouse a more permissive view of classification that would take into account, presumably, such a case as the classification of bachelors by their trait

of not wearing a wedding band, a classification that would only be a probable one at best since many married men do not wear a wedding band. It is certainly true that we categorize by features, and some features are merely there in many or most cases, whereas others are always there and essential to certain identification. Where it may not be possible to know if the essential features are present, we may categorize a matter or thing on the basis of its usually associated features. In such cases, we may say, "I'm almost sure that . . . / It's probably . . . / It seems . . . /," and so on. And, of course, we sometimes mistake the co-occurrence of certain features that are merely what Linnaeus called "properties," those that are always present but not definitive (they may be present in other objects outside the class as well) and those that are merely coincidentally there, "accidents," for the "essence," the features that are definitive. According to the investigations of Smith and Medin, speaking of their general features model, "The model implies that people are sensitive to and make use of many more features than would be expected on the basis of the classical view; people are assumed to use features that are only generally true of a concept's instances in determining category membership" (p. 67).

The associations and classifications described here may be described as factual ones. There are also the associations that nearly always accompany the factual, namely the emotional and valuative. We may feel friendly or unfriendly toward the object or that it is good or bad or reliable or treacherous or helpful or a hindrance, all depending on our past experience, including what we have been told about the object. These associations give us the connotative meanings of words, the suggested meanings that have an emotional content, and that often differentiate two words with similar factual (denotative) meanings.

Consider, for example, the words "unreliable" and "treacherous." For someone to be unreliable is not good, but for him or her to be treacherous is even worse, for the person who is unreliable is simply one who is not dependable, but one who is treacherous is deliberately and uncaringly that way. "Unreliable" and "treacherous" are also used to describe inanimate objects. This description works easily in the case of "unreliable" but requires that we personify the object to apply the word "treacherous." The sense of betrayal that we feel in finding something we have relied on to be unworthy of our trust inspires anger and the desire to censure the offending entity, be it animal, vegetable, or mineral.

The connotations of words distinguish supposed synonyms into discrete words that can only be properly used on certain occasions and in certain contexts, A synonym is in a majority of cases a synonym only more or less, depending on when and where we attempt to supplant its "equivalent."

The problems of word choice are with us for life largely because fresh perceptions of different objects do not always fit the associationally developed concepts. If we do not alter the concept to fit the perception, we are then forced to choose a makeshift word or set of words to express what we perceive. Concepts, then, are expressed with qualifications (e.g., "round" may become "nearly round," roughly round, "round on one side," "round enough to roll across the floor," etc.).

Because of our search for words, Einstein (1965) would not agree with those who insisted that language was necessary to thought; the thought inspires the search, after all. Words are labels for concepts and are the means by which we communicate conceptually with other human beings. Because words, too, are associative, with one another and with their related concepts, they act in the process of associating concepts into various classes of concepts and differentiating parts of concepts into subordinate concepts, all of which is what we call, simply, "thinking."

Piaget (1952), in his *The Origin of Intelligence in Children*, theorized that thinking comes about because conditioned response often fails and trial and error lead to conclusions (generalizations or classifications) about what will work in a given situation. In the first 2 years of their lives, Piaget's child subjects appeared to be learning by trial and error. From ages 2 to 7, the children learned to use words. At age 7, children will change from associating a word in a syntactic context, such as, "cookie" : "cookie is good," to word associations, such as, "cookie"/ "cake"/ "dessert" (Muma, 1986). From ages 7 to 12, the child consciously classifies objects, so that he or she would come to understand that "dessert" can include both "cookie" and "cake." As Vygotsky (1962) showed, children at puberty begin to conceptualize to new levels of abstraction, building a conceptual hierarchy. In their adolescence they learn many concepts in their schooling and for a time are better able to relate school-learned concepts to each other and to various other abstractions than they are to develop concepts spontaneously from their own experience.Adolescent idealism is a well-known phenomenon, and it is just the inability to test ideas with experience, and conscious logical analysis, that makes the adolescent an easy prey to emotion-appealing abstractions. Just as the infant had to learn by trial and error to develop his or her powers of perception and association into thinking, so, a number of years later, the adolescent must learn the soundness of his or her much more abstract concepts by testing them with perceptions of experience, first-hand experience, or experience known vicariously through the actions and statements of others.

THE RELATION OF LOGIC TO SEMANTICS IN DEDUCTION

The method by which we generalize and analyze is associational and classificatory; it is also, perforce, logical. Whether we operate on the language with classical logic or one of the forms of symbolic logic (Boolean, counterfactual, predicate, and, to a great extent, propositional), essentially, we are doing the same thing, analyzing the classification system used in our expression of thought in language.In classical logic we are given a syllogism, such as:

All philosophers are human.

Socrates is a philosopher.

Therefore, Socrates is human.

By the rules of classical logic this is a valid syllogism. Its validity can be demonstrated by considering the elements of the syllogism as a question of classification: Philosophers as a class, along with other people of various occupations, belong to a larger class (human). If Socrates is a member of the occupational class of philosophers, that means that he too is included in the larger class (human).A syllogism may also be written using transitive and intransitive verbs just as well as the copula. Consider:

All professors write books.

Jones is a professor.

Jones writes books.

Although the conclusion is untrue because the major premise is untrue, the syllogism is valid; that is, it is logical within itself. In classificatory terms, professors as a class are part of the larger class of persons who write books. Jones is a professor; therefore, like Socrates he is a member too of the larger inclusive class.Semantically, then, we may speak of Socrates as both a philosopher and a human being and of Jones as a professor and writer. In Jones' case we can, once the classification is made of him as a writer, infer that he has the characteristics of a writer -- that he must spend a lot of time taking notes and staring at the screen of his word processor, for example, because:

Writers generally, take a lot of notes and use word processors.

Jones is a writer.

Jones probably takes a lot of notes . . . etc.

Our thinking process, our logic, allows for different degrees of certainty. Hence, the use of quantifiers such as "some," "all," "a," "the," and adverbs of uncertainty such as "generally," "probably," and "possibly." Our definition of "Jones" will contain ascertainable facts and unascertainable suspicions.

In Russell's propositional logic a statement to be a proposition has to be true, and only propositions can be used to logically develop other propositions. False statements and those of probability are not considered valid at all. Since Russell and his cohorts developed his brand of logic, other logicians have recognized the need to account for the human sense of probability and possibility that we find not only in our common sense guesses about happenings in our lives but also in the calculations of scientists and mathematicians and in the fictional creations

of artists. These logicians have recognized that our logic operates in different modes or "possible worlds," or what the semanticist calls "semantic domains."

Russell's (1974) "The king of France is bald," is false, of course, because there is no king at the present time who could be bald, or hirsute for that matter. But the sentence, as Russell noted, is not meaningless. We do know what the words mean, and in order to know that the statement does not conform to the world of fact, we have to know what it suggests. In a novel, the king of Soporifia may be bald, and we will accept his being king of a nonexistent country and his baldness as well, because in that "world" facts are whatever the author decides to make them, and logic is based on the author's "facts" and not those of our factual world.

Assumptions of truth do, however, often result in semantic error, and that in turn can result in a false premise. Consider the following monologue:

I need a screwdriver to open the paint can. I have no screwdriver, so I cannot open the can. But, maybe something like a screwdriver will do. Here is something like a screwdriver, a knife, and it opens the can. So I did not need a screwdriver after all.

The major premise, in the first line, is corrected by association and experience and by a second syllogism based on "something like" instead of "screwdriver." Either the concept of what was needed was faulty (i.e., only the image of the screwdriver came to mind), or the word used to describe the concept of something to pry the lid off the can was incorrect, although it may have been the word closest in the person's vocabulary to describe such an object. Lack of experience, faulty recall, or faulty diction can be the culprit in such cases. The problem does not lie in the logic, because both the first and second syllogisms come to logical conclusions, although the first premise proves to be untrue due to an inexact classification of the object needed.

Symbolic logicians working with Boolean logic have spent a good deal of effort on the analysis of quantifiers in language: "some," "all," "many," "few," " a," "the," and so on. In doing so, they have not always appreciated the ambiguities of the quantifiers themselves. "The Buick is a nice automobile" could pertain to a specific, single automobile, the only Buick in the group, or it could pertain to all Buick automobiles or to Buicks of a certain date or style generally. George might like to drive nice automobiles, but we cannot logically infer that he would like to drive a Buick because we do not know what group of Buicks are "nice." In other situations, what is "many" in a small group is only a "few" in another, and unless we know the group referred to the quantifiers will be ambiguous. "Some" may be "more than half" or "a few," and there are many other discrepancies in the use of quantifiers that depend on their referents and the situational context of referents for their appropriate meaning.

Classification and quantification are the basis of deductive logic, and when that logic is rendered into language, the classificatory and quantitative concepts are represented by words that are often inexact or ambiguous in their reference. What appears to be a problem in logic may be one of semantics.

Either -- or classifications wrongly applied are often a source of error. These may be classifications such as on-off, yes-no, true-false, and so on, classifications allowing for no qualification. The determination of categories depends on our empirical ability to determine without a doubt that something is so or not so. Medical science performs a number of tests to make just such determinations: pregnant-not pregnant, HIV-positive -- HIV- negative, and so forth. Linguistically, the validity of such tests depends on the definition of such words as "pregnant" and "HIV-positive," and the implications (connotations of these words) depend on subsequent happenings in patients' lives. Over time, the tests may change, the definitions be modified accordingly, and the events in patients' lives may be far more varied and, hopefully, more benign, all of which will affect the meaning denotatively and connotatively of the either-or words.

By way of illustration, in the matter of pregnancy, although a person cannot be a little bit pregnant, she can show signs of a pregnancy that do not materialize. The problem there is in the test; it does not show either -- orness. If, however, a test is given that does show with 100% certitude that a woman is pregnant, the results of that test also have different meanings to physicians and to their patients. Pregnancy to the physician means monitoring it to term and taking whatever actions are necessary to preserve the life of the mother and the fetus. For the pregnant woman, the meaning denotatively is simply that she has the prospect of having a child. However, the matter is fraught with emotion, and the word "pregnant" may connote anything from a severe disruption in one's life to a sense of great fulfillment. On the negative side, "not pregnant" may bring frustration or relief.

In the case of the HIV test, at present it shows whether a person has AIDS or not. A mutation of the virus could cause the test to become less certain, so that "HIV-negative" might not mean that the subject is free from AIDS. An effective vaccine could, of course, make the HIV test far less traumatic and change its connotation.Now, borrowing a syllogism from an author who has used it to demonstrate a form of logic using negatives (modus tollens), let us see how the use of negatives rests on either-or assumptions. Here is the syllogism (Allwood, Andersson, & Dahl, 1977):

If it is night, Apollo is asleep.

Apollo is not asleep.

Therefore, it is not night.

Andersson used a modified propositional logic to show that this is a valid syllogism, but we may show its validity in a different way, one that also shows it to be resting on certain unstated assumptions: The first premise is based on a correlation: Night = or ≪ Apollo sleeps. We do not know if Apollo only sleeps at night, so "Apollo sleeps" may include *night* and no part, any part, or the whole of day. While we allow these ambiguities, we assume that there is only night

and not-night or day (the ambiguities of dawn and twilight are ignored) and that Apollo either sleeps or does not sleep (no half-waking states allowed).

In the second premise, we are told that the equal or more inclusive event, Apollo sleeps, is negated. Therefore, the event that depends on or can only occur with the god's slumber, "night," is also negated. The success of the syllogism, however, as much depends upon our acceptance of the either -- or-ness of the two common nouns in the first premise as it does on the logic of figurative language propositions or the logic of inclusive classes. The caveat with either -- or thinking is a corollary to what has already been said about the definition of objects and the use of quantifiers, that measurements of qualities (the blackness of night, the physical unawareness of sleep) are usually matters of more or less, matters of degree.

Like the relativity of synonyms, antonyms (such as "day" -- " night") are also differentiated and made disproportionate by their denotative scope and by their connotations. "Day" includes night in its 24-hour sense and excludes it in it the sense of sunrise to sunset. A day of reckoning has no night of unaccountability to antonymically balance it, although "night" does have more suggestion of unregulated permissiveness than "day" does when associated with human behavior.

To this point, the ins and outs of deductive logic where semantics is concerned have been discussed. What should be said about inductive logic, causal reasoning, and analogy?

THE RELATION OF LOGIC TO SEMANTICS IN INDUCTION

Semantic effects on induction are largely a matter of classification of the cases or events that one will draw the inductive generalization from. In the example of the screwdriver, whatever trials had been made prior to the one in question had apparently not included a knife but had included a screwdriver most successfully. What was needed was a pry of some sort, and the person involved thought he could narrow down the items needed to some sort of screwdriver used as a pry. He narrowed too far and gave a too restricted classification to the sought-after object. Eventually, in broadening his classification he settled for "something like a screwdriver," which, literally, is vaguer than the word "pry," which he never used but the concept of which he must have had in mind. Semantically, his faulty conceptualization of the tool that was needed was a failure in classification that led to the use of the wrong word, "screwdriver," and then when he modified his concept, he failed to attach the most exact word to it, a failure in diction if not in conceptualization.

Causal reasoning is essentially inductive. We know from experience and many trials that a certain sequence of events will occur with high probability, amounting to certainty, if certain initial parts of that sequence are always present, so we infer the subsequent events, the initial ones being the "cause" and the subsequent ones the "effect." We may reason back in time too, from the effect, inferring the cause. So we turn on the switch and the light goes on, and we say

turning the switch caused the light to go on, and conversely, the light goes on, and we say that someone must have turned the switch.

However, we know that someone may not have turned the switch. Still, the light went on. So we theorize that if it was not someone switching on the light then there would have to be some other cause in the chain of events to the effect, some other action that took the place of someone turning on the switch. Perhaps the switch was on but faulty, and with a bit of motion in the wall on which it was located its contacts finally met, or perhaps the bulb was not altogether screwed in, likewise waiting for a nudge from some other source to light, or perhaps. . . . If what we called the cause of the effect of an action was incorrect, it was due to our not understanding fully the possibilities or assuming the most probable event was the cause or would be the effect. Also, as with other inductive logic, classification and diction may be faulty. For example, is the switch "on" when its lever is turned or when current is flowing through the switch? Should we say "bulb that is not burnt out" instead of "light"? and so forth.

It is perhaps appropriate, at this point, to say that inductive and deductive logic are not polar opposites and that most logical reasoning is not purely one or the other (either/or). John Stuart Mill (see Nagel, 1950) made this point well enough 150 years ago in his discussion of what he called "inverse deduction"; that is, the premises of deductive logic, unless they are merely taken on faith, must be derived from experience and from inductive trial and error. In the example earlier, many trials have led the person to conclude that the light going on is controlled by the switch, to the point where he may express his belief as: "If the switch is turned in the right direction, the light will go on. And we may carry this forward deductively with: I am turning the switch, so the light will go on. Ah, nuts! I'm still in the dark. My deduction was incorrect. I'm wearing my fingers out turning this &*%$# switch!"

This trial proved that the light will not always light when the switch is turned, so not only was the major premise of my deduction untrue but this trial has changed its inductive base so that the inductive conclusion, deductive major premise, can be expressed only as one of possibility, or with sufficient sampling, of some probability less than certainty. Errors in induction can then become deductive errors as they are carried forward into the deductive premises. From a number of trials we erringly concluded that the switch always functioned properly and that the switch alone controlled the light. The concept of the switch as infallible needs to be modified and controlled needs qualification. These conceptual errors have led us to express a simplistic view of the bulb in simplistic words: "switch" without the "properly functioning" qualification, and "Will go on" without qualification, "ususally" or some such adverb. Thus, insofar as the faulty concepts are expressed in words they will result in semantic problems of communication.

The switch manipulation, that we have been speaking of is illustrative of the induction -- deduction relationship, and it is also illustrative of problems in causal reasoning and that reasoning's attendant semantics. To say that something caused something else to happen or made it happen always excludes numerous related conditions that are contributory to the effect, either actively or passively. A running back fumbles the ball, and the opponents recover and score a touchdown. That "turnover" is blamed for the touchdown. But consider how many other factors are present or not present that are also part of the causal pattern. Had the cornerback not

been moving toward the center of the field, expecting a draw play, had the running back not tried at the last moment to avoid being hit by a 250-pound lineman, if the defense had been stronger on the succeeding play when the touch-down was scored, if the runner who scored the touchdown had fumbled the way he did the previous week when he ran the same play, and if, . . . then the touchdown would not have been scored and the turnover would not have occurred or would not have been a factor in the opponent's scoring a touchdown. Causes may be proximal or distant too. If the teams had not been scheduled to play, there could have been no turnover in that game. Causes that are merely contributory under certain conditions are too often stated as absolute. The word "cause" should always be suspect and so should the near-synonyms "make," "force," and so forth.

With regard to causation, the relative adverbs "why" and "how" are often used, almost interchangeably, as in "How/why did that happen?" There is a difference, however, in what is being asked. To ask "how" is to ask for a description of the sequence of events. To ask "why" is to ask for an analysis of the events, to attribute causation to certain preceding events, and it often connotes an attribute of responsibility to some agent of the action. In colloquial expression, however, "how" can be uttered in such as way as to imply responsibility and blame and "why" can be uttered in a wondering way that merely expresses a desire for understanding.

Differences in diction and in the classification of objects are even more problematical in reasoning by analogy. An analogy is offered to explain the complex by the more simple and concrete. An electrical circuit is often explained as a flow, like that of a fluid through a hose or pipe. This gives us a picture of what is happening for an event that is not in itself usually visible. Like all analogies it is valid only in terms of the attributes of each element of the comparison that is truly like the other. Fluids wet; electricity does not. Fluids are sent along a hollow conduit, but electricity is usually sent along a solid wire or metallic strip. So long as these different attributes do not matter to the functions being compared, they can be set aside, and we can go on to talk of "resistance" in the circuit as though there were an obstruction in the fluid's pipe, and so on, but if we carry the comparison too far, into areas where opposing attributes nullify it, we have exceeded the bounds of the analogy.

In analogy we have two classes of things that we are saying are equal in certain respects. The classes overlap, but they are not the same, and the attributes that are outside the overlapping area must never be construed as being within it. Otherwise, if, for example, we compared the overflow of the fluid in a pipe to a burst of electricity at the end of a wire, we would hardly be able to explain raido transmission successfully, nor would some gullible soul appreciate the jolt he would get when he thought he was only going to get wet. So, when we say "flow" in terms of electricity, the word must be understood in a restricted sense for it to be semantically correct.

SUMMARY

Logic in all its manifestations is based on perceptions that have become conceptualized (generalized) into classes of objects and actions. This classificatory process is the essential starting place for all thought. When we begin to build a hierarchy of classes or to reduce large classes into smaller ones, we are exercising logic, our innate abilltiy to see similarities and

differences in the attributes of these classes and to regroup them into new combinations. This is logic, not semantics, and logicians who attempt to subsume the study of semantics under their discipline or who treat semantics as a matter of labels for the logical process are only dealing with semantics in a very limited way.In the considerations of various forms of logic we have seen that words are indeed important as descriptions of the concepts involved. As such they may be well-chosen or ill-chosen, depending upon how well they describe the attributes of the concept. If well-chosen they will describe the concept accurately, but this is not a static function. As the concept is modified through successive trials, the words must change to fit, or else we are apt to have a verbal expression that is illogical, as we would if we did not modify the words based on our experience with the light in the example given earlier.Semantics is apart from logic but essential to its communication and necessary to its analysis. It is also a study that goes beyond logic to many other considerations of perception and mental activity, as is seen in subsequent chapters.