# WHAT IS THE LINGUIST'S OBJECT OF INQUIRY?

by

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#### ABSTRACT

central issue in linguistic metatheory is raised: which is the most adequate object of inquiry for the science of language? This object is initially constrained by the universal desideratum that it be compatible with science. Thus, notions of science are surveyed and the one that seems most in keeping with actual scientific practice adopted to make this constraint explicit. It is also constrained by the make this. initial assumption that language-related fields are all studying the same object, so it has to be compatible with all of the fields that will make use of it. The literature is ' surveyed for notions of language which are grouped by the assumptions they are based on, and subjected to critical examination. A notion of language systems of brain processes was preferred as a as literature on process beginning, and models was surveyed to fill in some more detail and check compatibility of the model with existing empirical this field. Finally; the metatheory results for constructed (notion of science plus notion of object of inquiry) was shown to provide, in principle, a common denominator for relating the different fields of linguistic inquiry, thus demonstrating its unifying besides its explicitness and external power, consistency.

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# RESUMÉ

Une question centrale de la métathéorie linguistique est soulevée: quel est l'objet d'étude le adequat pour les sciences du langage? Une plus contrainte est initialement imposée sur cet objet par le desideratum universel qu'il soit compatible avec la science. Par consequent, des conceptions de la science sont passées en revue et celle qui semble la plus fidèle à la pratique scientifique est adoptée afin de cette contrainte explicite. rendre Une seconde contrainte vient de l'hypothèse initial que les domaines reliés au langage étudient tous le même objet, il doit donc etre compatible avec tous les domaines qui l'utiliserons. La littérature est passée en revue afin d'extraire des conceptions du langage, regroupées par les suppositions sur lesquelles elles sont basées, et soumises a un examen critique. Une conception du langage en tant que systèmes de processus cervicaux fut préférée comme point de départ et la littérature portant sur des modèles de ces processus a été passé en revue pour fournir davantage de détails et vérifier la compatabilité de ce modèle avec les resultats empiriques de ce champ. Finalement, nous montrons que la métathéorie construite (conception de la science plus conception de l'objet d'investigation) fournie, en principe, un dénominateur commun qui permet de relier différents domains d'investigation linguistique, les demontrant ainsi son pouvoir unificateur, en plus de son caractère explicite et sa cohérence externe.

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"If we are willing to restrict our range of inquiry sufficiently, we will be able to find some answers easily, but they will have little bearing on anything of importance. If we insist on dealing with large our first attempts questions, at answers are likely to be mistaken, or untestable without a great deal of further work. But our answers to questions are only worthy of the name science when they are both of significant and testable. Theory best available divorced from the knowledge is irrelevant, a castle in air, and by that token of no the interest to science. But knowledge which fails to rise to the level of theory is of equal lack of interest, . accumulation of unconnected an trivia.

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Science lies between these two dangers. In the era now past, descriptive linguistics in America has steered uncomfortably close to the Scylla of triviality. It is now necessary to change course, while avoiding as well the Charybdis of irrelevance."

(Teeter, 1964: 206)

#### INTRODUCT I ON

WHAT IS THE LINGUIST'S OBJECT OF INQUIRY?

"Quel est l'objet à la fois integral et concret de linguistique? la La particulièrement question est verrons plus difficile; nous tard pourquoi; bornon-nous ici faire á saisir cette difficulté."

(de Saussure, 1914: 23)

# 0.1 Problem.

Linguistics, like many other fields of inquiry, ill-explored rather foundations: rests ' on philosophical and methodological assumptions are frequently accepted or rejected more on the strength of intuition than rational discussion, which in turn is often made more difficult by the indeterminacy of the terms (and the underlying concepts) involved. The case in point to be tackled here is that of the term "language", as in "Linguistics is the science of language."

The term "language" is important in maintaining the cohesion of a loosely allied group of disciplines: there are branches of linguistics, psychology, philosophy, neurology, anthropology, sociology,

artificial intelligence and mathematics that all profess to study "language." However, upon examination one discovers that concepts of "language" differ widely, even within branches of the same field. This, in our view, seems to weaken the ties between these fields, hamper useful cross-fertilization, and even cast in doubt the validity of such an apparently ad hoc aggregate of disciplines. In the absence of a theory relating these fields, we have no principled grounds for demonstrating the relevance of work in one subfield to hypotheses in any other.

the other hand, scientific discourse is On characterized by a trend towards the minimization of the ambiguity of its terms in an effort towards clarity of thought and efficiency of communication. We are left, then, with two choices. Either impugn the interdisciplinary enterprise and consider that the diverse administrative units of the university which profess an interest in "language" are laboring under the 'illusion of studying phenomena of the same domain, or make the assumption that we are correct in our intuitions that these phenomena 'ultimately cohere into what may justifiably be called a unique object of

inquiry. In the case of the first option, we are left with the tasks of tagging the diverse concepts of "language" unambiguously so as to eliminate any confusion that might arise from collapsing them, and of defending the view that what the (e.g.) anthropological linguist and the neurolinguist study are in principle unrelated. Opting for the alternative view, we assume the burden of demonstrating that and how these approaches are sufficiently related to justify only one notion of "language", and of choosing one, as well.

None of the tasks above are to be taken lightly, 'and of course strong arguments can be made for both theoretical, as well sides on practical as methodological grounds. Nevertheless, a choice of initial assumption must be made, though it be on the basis of intuition, reasoned argument or statements of authority, and we will here opt for supposing that there is a common object of inquiry. The body of this thesis, then, will's be in the form of arguments for choosing one central construal of "language" based on a system of views able to support a demonstration (that we can only point towards here) of the interrelatedness which are all called of the diverse phenomena

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"language."

Thus, our main task is to examine diverse notions "language" and choose one that can in principle of serve for all of the disciplines that make use of it; and in so doing adopt a position with respect to a preferred notion of linguistics. But which criteria can we use to make such a choice? Consensus? There is none, and even if there was, it would be no reason for preferring one notion over another. Authority? By the same token, unquestioning acceptance of others' views place in an enterprise that is has be no to characterized as critical. Simplicity? This clearly can not be an overriding concern for we are interested in the most appropriate content (if one is speaking of formal simplicity), and one that has to be complex enough to be applicable to several different fields (if one is speaking of simplicity of content) while still being heuristically fruitful (see Bunge, 1963 for other At best these arguments). can be very limited, partial, desiderata.

Instead, we can use the criteria that underlie (implicity or explicitly) the critical evaluation of scientific theories (from Bunge, 1967: Ch. 15):

 i) clarity and meaningfulness, i.e.: minimal ambiguity and vagueness, empirical interpretability, logical relatability of statements, maximal. representativity or mechanismicity of theories (his semantic criteria).

ii) testability (of a theory, its assumptions and even the techniques used to test it) and methodological (not absolute) simplicity, i.e. moderating complexity to within testable limits (his methodological criteria).

iii) internal consistency, i.e. well-formed compatible statements that are logically and mathematically consistent and based on strong, independent initial postulates (his formal criteria), and

iv) external consistency, or compatibility with the greater portion of well-confirmed results of the rest of science, and unifying capacity, together with generality, depth, originality, heuristic potential and stability (his epistemological criteria).

In practice, external consistency and unifying capacity (iv) will be the most important criteria, since we will assume for the sake of argument that all

of the alternatives will be equally acceptable in terms of clarity, testability and internal consistency. In other words, we will seek to examine to what extent the definitions and assumptions underlying the alternative notions of "language" are corroborated by findings in other fields. This is of maximal importance for a notion of "language" that will be applicable in (and able to unify) all of the fields that need to use it.

# 0.2 Approach.

Let us situate our questions in the wider context of the philosophy of science to provide the background and perspective we will find necessary as we progress.

Our questions fall within the domain of a theory of linguistics. Such a theory would deal with the assumptions, concepts, methods, etc. on which linguistic inquiry is based. Since this bears directly upon in what ways and to what ends one constructs theories in linguistics, it can be called linguistic metatheory [fn 1].

Linguistic metatheory seeks to answer the questions 'What is linguistics?' and 'How is it best conducted?', among others. A minimal metatheory will

give an account of the former by answering two questions (see Woodger, 1939 for a different view):

a) What is Science and in what ways can this be applied to linguístics?, and

b) What is (the nature of) the object of inquiry, i.e. what is language? That is, it seeks to provide an elucidation of the terms "science" and "language" in "Linguistics is the science of language." What we intend to arrive at in this study is, in sum, a minimal metatheory that is explicit and consistent. The truth and fruitfulness of such a metatheoretical viewpoint are clearly open to empirical research and debate; this, of course, is why it is merely a point of departure.

A complete metatheory, on the other hand, would complement these with other questions about the logic, goals, values and ethics characteristic of the discipline (see Medawar, 1969, but esp. Bunge, 1980b), i.e. we are construing metatheory as encompassing the formal/logical aspects of theories as well as the social and philosophical aspects of the theorists who build them, on the assumption that these aspects interact in a non-trivial manner. We leave this issue

aside, however, to concentrate on the assumptions that underlie the selection of a construal of the linguist's object of inquiry.

Such metatheoretical inquiry, if in turn carried out in a scientific manner, will be part of what we call (with Bunge, 1959) Metascience, i.e. the science of science. Traditionally, however, it has been the domain of the Philosophy of Science (or of the individual sciences) and as such is often not, along with the rest of philosophy, considered to be very scientific. One solution to this, as set forth in Bunge's work (see bibliography), is that of 'upgrading' the philosophy of science: rendering it more exact, more subject to change by new evidence, and more verifiable, thus yielding what 'is called scientific or exact philosophy (see Agassi & Cohen, 1982; Bunge (Ed.), 1973). In this vein we will equate linguistic the (scientific) philosophy metatheory with of linguistics, one of the metasciences (see also Botha, 1981: sect. 1.5; Itkoneh, 1978). We would not claim, however, that this is an essay in exact philosophy; rather it is an analysis of the issues in terms that point to the necessity of using exact philosophy.

the relation between such a metatheory What is the theories to which it refers? We view a and metatheory as a sort of "interface" between the general worldviews of philosophers and the specific needs of study of some family of phenomena. the Where a would point metatheory out most general the philosophical assumptions to quide research, the theory. construction itself would provide feedback as to the validity of those assumptions. Thus, theory and metatheory are seen to be mutually dependent: one must make some general assumptions in order to construct theories, i.e. there is no philosophy-free science, and by the same token metatheory needs to be based on the results of theorization, i.e. philosophizing should be based on science as well [fn 2]. Along the same lines, we can also conceive of the interaction of theory and experiment or experience as reciprocal, and postulate as there are no valid theories without that just corroborative experience, experience is not given to us a priori, without our active intellectual involvement. Clearly such statements as these are far from being entirely borne out by research; they figure here only to make explicit the assumptions with which we are

approaching this analysis.

we are adopting a metatheoretical In sum. approach which is to say that we will be examining the concept of "language" across theories and in the light. of philosophical doctrines and empirical evidence from relevant fields. This opposed to can be more approaches, which speculative philosophical unfortunately pay little attention to the empirical data available, and to theoretical approaches which try to develop the notion within a single theoretical framework, thus often leaving the assumptions on which it is based unexamined.

0.3 Objectives.

Our objectives in this study are to arrive by explicit and systematic argument at a preferred construal of the term "language." Since "linguistics" and "language" are mutually interdependent, we will also be in a position to give a preferred construal of "linguistics." "Preferred" in this discussion is to be understood as preferred given the criteria above and the assumptions, evidence and arguments below.

Since we have made the initial presupposition

that "language" is to be understood as something that can and should be studied in an interdisciplinary fashion, another objective would be that the body of the thesis serve as an argument in favor of this view. Finally, if our arguments are carried out convincingly enough, then we will be able to demonstrate the relevance of metatheory and, philosophical considerations to the development of linguistic theories.

# 0.4 Originality.

per the requirements of the Faculty of As Graduate Studies and Research, some statement as to the originality of each thesis need be made, though clearly Master's thesis of this а scope can make few pretensions of offering original contributions, to the field. Nonetheless, it should be noted that there is, to our knowledge, no treatise or monograph on the notion of "language", though introductory textbooks usually raise the question (in a superficial manner), and more general works have dealt with the question in some detail, though not as much as we attempt here (see .g. Itkonen 1978, Mackey 1965: Ch. 1, Mounin 1969,

Paivio & Begg 1981, Vermeer 1971, Ducrot 1972, etc.)

Moreover, new to linguistics is the philosophical framework of Bunge's Scientific Materialism, so that our development of a materialist notion of language, in some more detail than the sketch offered in Bunge (1983c), might also be considered a contribution. Finally, there is no explicit development of a linguistic metatheory in the literature of the field (though Botha 1980 and 1981 approximate our notion of metatheory), so that to the extent which we succeed in developing one it will be an original contribution.

## 0.5 Organization.

This study, then, will be organized as follows:

In Chapter One we will discuss notions of Science in order to make our assumptions with regard to the nature of science explicit, and show how this can constrain the notion of object of (scientific) inquiry.

In Chapter Two we make a survey of the major notions of language that have appeared, but organize them according to the assumptions upon which they are based (with respect to what "language" is, how it develops and how we can find out about it).

Chapter Three consists in a critique of the views surveyed in Chapter Two and arguments for choosing from among the assumptions, finally arriving at a preferred, though skeletal, construal of "language."

Chapter Four attempts to provide some more detail about the construal arrived at in Chapter Three, at least with respect to a certain aspect of the definition: the notion of process. Thus representative work on process models of language skills and knowledge "representation" is surveyed.

Our Conclusions summarize the arguments given and sketch the notion of linguistics that falls out of the asssumptions chosen, emphasizing the role of metatheory in explicating the relations between the different fields that study "language".

#### Notes: Introduction

Our use of the term 'metatheory' diverges 1. the precedent of using 'general linguistics' from (Lyons, 1981) or 'linguistic theory' (Chomsky, 1965) for such investigations, and of using 'metatheory' as parallel to the innate component of the language faculty (UG) (Chomsky, 1979: 180), or restricting it to "une théorie des grammaires" (Dubois et al., 1973: 318). This is so because a) we do not find a dichotomy between 'general' and 'specific' (or between general. and descriptive) linguistics fruitful: specific or descriptive linguistics is 'general' linguistics applied to the description of specific languages (Lyons, 1981: 34-35) and thus overlaps with the pure/applied distinction which needs to be used (Lyons, 1981: 34-35) and be used elsewhere hence is independently justified. b) Lyons' (ibid) construal of general linguistics is the study of language, where Botha's (1981: 171) is the study of the language acquisition device -- clearly such confusion should be avoided; c) Chomsky, too, seems to use 'linguistic theory' ambiguously to refer to theories of language, linguistics and theories of grammar, thus confusing already difficult issues; and d) UG (hence metatheory) seems to be construed by Chomsky (1979: 180) as that which explains how a child who by analogy is called a 'little linguist' gets from data to grammars:

> "Chomsky (1965), Katz (1966), Fodor (1966), and others have suggested the metaphor of the child as a little linguist who tests hypotheses to discover the syntactic rules of his language. Both the child and the linguist test hypotheses in the form of candidate rules, and both use linguistic evidence to confirm or disconfirm those hypotheses." (Valian, Winzemer & Erreich, 1981: 188)

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Firstly, we wish to dissociate our notion of metatheory from any analogy to child language acquisition, since the analogy does not seem useful. In fact, the disanalogies are so many as to make it a misleading comparison:

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cognitive skills

individual approach

of analysis are

- innate (e.g. UG)

to analysis. most important .

determinants

etc.

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Child

ely \_\_\_\_developed, largely\_committed\_ nervous system goal-directed data search systematic access to syn- and diachronic data highly developed metacognitive skills social approach to analysis (ask colleagues) most important determinants of analysis are learned etc.

Linguist

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Secondly, we see metatheory as much more complex than a black box that takes language data as input and provides (an evaluation of) a grammar as output.

2. At this point we should distinguish between descriptive and prescriptive metatheory. Where the first seeks to describe what (e.g.) linguists in fact. do, the second suggests what they should do. Here we will join descriptive metatheoretical observations with view of science to generate a prescriptive а metatheory.

#### CHAPTER ONE

#### WHAT IS SCIENCE?

"Fruitful theorizing in science is probably not so much a question of being complete, or right or wrong, as it is a question of making explicit what we presuppose." (Saugstad, 1980: 18)

### 1.0 Introduction.

Linguists have long been preoccupied with making linguistics a science proper, and consciously so since at least the 1920s (cf. Bloomfield, 1926, 1930; Sapir, 1929). To make this a meaningful goal, however, we need to make explicit the notion of science subscribed to and insure that the object of study is consistent with the assumptions of that notion. In this chapter we will examine some of the notions of Science that have been espoused by scientists and philosophers of science, and how they constrain the object of inquiry.

various notions of science sketched below The been proposed as ideals to be strived for and have characterizations of intuitively scientific what activities have in common. Thus, each has / its prescriptive and descriptive interpretations. We will be interested primarily in the descriptive adequacy of

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these characterizations, assuming that to the best descriptive notion will correspond the most appropriate prescriptive interpretation. In this way we will speak of a science as having the aims and the other assumptions presented as typifying the family of views referred to in each of the positions below. All of this having been said, let us examine some of the different notions of science [fn 1].

1.1 Single-feature Characterizations of Science. In this section we describe four of the more obviously inadequate, hence not so influential, views of science and examine the roots of their inadequacy.

1.11 The Consensus View. This is the position that science is characterized by a certain lack of controversy, at least much less than in the humanities and other non-scientific fields (see e.g. Kuhn, 1970; Ziman, 1978: 3). "Everyone" in the scientific community believes in Darwinian evolution, quantum mechanics, genetic transmission of physical characteristics, etc. On the contrary, there is great controversy, according to this view, over who wrote the Bible, if Socrates was real (if he was, where and when was he born and what

did he think), what the nature of the mind is and its relation to the brain, whether ESP exists, etc. Hence the former are scientific where the latter are not.

To see that this is inadequate, one need only consider the fact that many people believe in God, the Devil and intelligent life in other galaxies, and we would be led rather unwillingly to say that theology, demonology and intergalactic psychology are sciences. On the other hand, the sciences, are full of does evolution refer to populations, \* controversy: species individuals? (Ghiselin, 1981), which or interpretation of guantum mechanics is more adequate -the Copenhagen (subjectivist) interpretation or the objectivist interpretation? (Bunge, 1973; Burgos, 1982) Do gravitational waves exist? Is a Unified Field Theory possible?

Finally, if consensus were the defining characteristic of science, exactly which people would have to agree, and to what extent? How would this be different, e.g., from the generalized agreement in some countries that communists are to be feared? Rather than consensus, science is characterized by systematic means for resolving such controversies: reasoned

hypotheses and careful experimental tests.

1.12 The Empirical Content view holds that science only involves empirical data and inductive generalizations that can be rigorously traced back to them (see e.g. Bloomfield, 1933, 1936). Outside of science is the realm of speculation and unobservable theoretical entities. Where the humanities and "soft" sciences are often rife with concepts such as intentions, status, metaphysical entities, etc., science shies away from these things because they are beyond the real world observables that lend credence to knowledge.

This view of science, however, would have it that Einstein was a charlatan or a philosopher, not a scientist, that theoretical biology is on the same footing as creationism, and that cosmology is as scientific as religion. It makes for a science with no hypotheses, no theories and no explanation based on them. Science clearly has a different view of the acquisition of knowledge; one that incorporates both theory and observation.

1.13 The Success View. Partisans of this defining characteristic would have it that the main

feature of science which distinguishes it from other activities is success (e.g. James, 1907: Lecture II). Science has been successful in discovering and proving facts, in leading to inventions and improvements in our life, where the non-sciences have way of not contributed anything of this kind, hence have been unsuccessful. What have philosophers, theologians or sociologists proven invented of or comparable importance? Theirs are the so-called "ivory tower" disciplines, populated by people who are alienated from . the real world thinking about problems of no practical consequence, according to this view.

In sum, success is equated with practical utility why this view was (which is espoused by the Pragmatists) and science is useful where non-science is not. But how, then, to distinguish technology from science? Is Newtonian mechanics to be considered non-scientific because it is not successful in accounting for relativistic phenomena? Of what practical use are gluons and quarks? Is. quantum mechanics non-scientific because it cannot account for . the Einstein, Podolsky & Rosen (1935) paradox? Parapsychological research has been "successful" in

showing that some people have paranormal abilities (but see Alcock, 1981). It doesn't seem that characterizing parapsychology as science and Newtonian mechanics as non-science would be very satisfying, nor would it enable us to distinguish between a "scientific" night at the casino and a "non-scientific" one. Science has goals other than utility, and these are what distinguishes it from technology and other purely practical pursuits.

The Formalist view defines a body of 1.14 knowledge as scientific only if it has been thoroughly mathematized, by analogy with the "advanced" sciences (see e.g. Galileo, Kant, Husserl and, implicitly, Chomsky, 1980). Thus, physics, chemistry, mathematical psychology, statistics and transformational grammar, but not emerging sciences (e.g. neurolinguistics), experimental studies (as in medicine) or fields of study that have not couched their knowledge in formal much psychology, terms (e.q. of neurology, linguistics).

This position underlies appeals found in some of Chomsky's recent writings (1978, 1980) to "the Galilean style" of linguisic inquiry (see Botha, 1982), and is a

component of positivist, rationalist and refutationist views, as well. However, it is tantamount to saying that the content and reliability of the knowledge represented by the formalisms doesn't matter, only the form in which it is presented. This would not allow us to distinguish between formalized nonsense (as . in the Journal of Irreproducible Results) and science. Clearly, science constrains the objects and problems it will study and emphasizes content and reliability of knowledge, as well. Nonetheless, the merit of this view is in recognizing (with many others such as Leibniz, Bolzano, Russell, and Bunge) the need for the explicitness that mathematization can provide and which makes progress after a certain level of complexity possible.

1.2 Multiple-Feature Characterizations.

Methodologism is the view that science is defined by its use of "the" scientific method, and one variant of this view that we will consider in more detail is that of Positivism (or, more precisely, Neopositivism), since it was influential in linguistics for most of the first half of this century (cf. Koerner, 1982).

1.21 The neopositivist view of science, which seems to have typified most of the 'descriptivist' period of American linguistics, and was influential both inside and outside of linguistics, corresponded to the following set of positions (Kolakowski, 1972: 13-15):

a) phenomenalism: science deals only with observable phenomena, and their immediate causes (cf. Bloomfield, 1936);

b) nominalism: science aims at organizing facts:

"The world we know is a collection of individual observable facts. Science aims at ordering these facts, and it is only thanks to this ordering work that [something] becomes a true science..." (Kolakowski, 1972: 14-15)

"...if the facts have been fully stated, it is perverse or childish to demand an explanation in the bargain." (Joos, 1957: v)

c) mathematism: science uses mathematics, and values simplicity and explicitness;

d) anti-philosophism: science is the antithesis of philosophy, which is a source of speculation or nonsense, not knowledge, and should thus be avoided:

"It was the doqma central of the positivists of the Vienna Circle that metaphysics is sheer balderdash: that its assertions are not false, but no assertions at all -- just senseless babble." (Popper, 1974: 965)

"Discussion of the fundamentals of our science seems to consist one half of truisms, and one half of metaphysics; this is characteristic of matters which form no real part of a subject..." (Bloomfield, 1926: 129)

As well, the Neopositivists embraced a form of the Empirical Content view described above, which accounts for their similarities with proponents of that position, and emphasized predictive power of accounts over their explanatory power. Science, however, attempts to go beyond mere appearance to describe, explain and predict phenomena, and with the help of philosophy, since it cannot be escaped (Teeter, 1964: 198).

1.22 Refutationism. Another philosophy of science that has become popular in the last half-century is that attributed to Popper (1959, 1963), i.e. refutationism, which defines the hallmark of science as its falsifiability. From this point of view, physics and chemistry are scientific to the extent which we can put their statements to objective experimental test. On

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the other hand, philosophy, psychohistory, and theology are not sciences because we cannot perform objective tests to judge their statements. Moreover, refutationists would have science accumulate its negative results, since they are the surest knowledge obtainable.

More precisely, the Popperian view of science is that scientific statements are "falsifiable" (1963: 40), "intersubjectively testable" (ibid: 56), and "have the form of singular existential statements" (ibid: 102). In other words "a theory is scientific iff it is falisifiable, i.e. if it is inconsistent with at least one singular existential statement that can be tested by inter-subjective observation" (Johanssen, 1975: 16). This also, implies that the theories have to be consistent as well, since an inconsistent theory entails anything (ibid: 17). Thus, Popper's main criterion for solving the demarcation problem (between science and non-science) is a methodological one: it bears on what form statements can take and how they need to be falsified, without specifying what they should refer to or be used for. In this sense, then, Popper too reduces science to a set of methods or

methodological principles (though he includes some logical principles, as well), hence refutationism is a form of methodologism.

However, we have already noted that science constrains its domain and problems, is interested in the use to which knowledge is put, i.e. description, explanation and prediction, and is interested in the content as well as the form of its statements. Finally, science is concerned with accumulating positive knowledge -- negative knowledge makes up fields like parapsychology: its phenomena are not biological, or chemical, or physical, etc.

# 1.3 Rationalist Science.

This term is justified by Cook's (1981: 289) observation that "the true unity between the thought of Descartes and the thought of Chomsky lies at the level of the philosophy of science" (see also Bracken, 1970: 192). Cook (ibid) also provides the only detailed study of Chomsky's philosophy of science in the literature. Let us then leave it to him to characterize this view (Cook, 1981: 296):

"Chomsky's view on the methodology of science can be encapsulated in a philosophy of science that draws from four major doctrines that are operative in current and classical theories about the nature of the natural and human sciences. These doctrines are: logical positivism, Weltanschauung analysis, empiricism, and interpretationism. From logical positivism Chomsky derives his model of scientific explanation and his emphasis on formalism in science. (...) From Weltanschauung analysis, Chomsky derives his views on the theory-laden mature of scientific observation and his emphasis on the importance of the context of discovery forthe philosophy of science. Chomsky's unity of method doctrime is drawn from classical empiricism. Finally, from the interpretationists, Chomsky adopts the view that an explanation of psychological social behavior must include or а reference to the mental states involved in . such behavior."

Chomsky thus avoids many of the pitfalls of his predecessors, but still makes no statement about the kinds of problems, the limitations of the domain, or other properties of science. As well, he emphasizes the theory-laden nature of scientific observation at the expense of the observation-laden nature of scientific theories. In adopting the stance that reference to mental states is a necessary condition for a scientific theory of "language," he likewise must adopt a theory of mind that is detailed enough to be testable, and relevant enough so as not to fall into explanations of

the obscure in terms of the even more obscure. Clearly, saying that "language" is a mental phenomenon is vacuous without a testable theory of the mind.

We have seen that to adequately characterize science we must define it along several dimensions, including aims, methods, problems, epistemology, etc. The above account of Chomsky's view shows that he is sensitive to this fact, but omits some of the parameters. The following view, then, will have to be prefered for its attempt to characterize exactly how science defines its domain. methods and other assumptions.

# 1.4 Philosophism.

For proponents of this final view of Science, the attempt to account for the its distinctiveness with a single attribute is futile and can only yield results comparable to those of the seven blind wise men in the old fable about the elephant. Like most human endeavors, Science is too complex to be characterizable by a single feature. We give this view, taken from Bunge (1982), the name "Philosophism" because it is the only position considered here that makes certain
philosophical assumptions an explicit defining characteristic of Science. This, and its relative complexity, justify more prolonged attention here.

In this view, then, science is not a method, but an approach, (we will also refer to this view as the Scientific Approach) which includes a general worldview (ontology, epistemology, ethics - sect. 1.51), some body of background knowledge (sect. 1.52), a domain (sect. 1.53), a problematics (sect. 1.54), a set of aims (sect. 1.55), and a set of methods (sect. 1.55) -as a first approximation. In particular, a given science (S) is said to consist of all these components, which we will consider in more detail in the following sections. (see Bunge, 1982 for a more explicit account).

1.41 Worldview. The General Worldview is composed of:

a) a naturalistic ontology, according to which the world is composed only of concrete, changing things (i.e. interacting systems that are not entirely given a priori but need to be delimited by the observer, as well).

b) a realistic but critical epistemology within

which "one can frame relatively accurate symbolic representations of things with the help of experience as well as reason;

c) the ethos of the free search for truth, rather than, say, the reliance on authority, consensus or utility.

The ontology (or general Weltanschauung) that Bunge attributes to science is identified and systematized in his own work (1977a, 1979, 1980a, 1981), and can be characterized as materialist, systemist, and emergentist (see 2.2 below).

The view of epistemology that is characteristic of Philosophism, or the Scientific Approach, is one that eschews both rationalism and empiricism, yet embraces aspects of each (see Bunge, 1983b). It is:

-realist, in that it assumes the independent existence of the world;

-critical, because perception does not suffice for knowledge, i.e. experience is necessary (moderate empiricism) and reason is also necessary (moderate rationalism) for knowing the world;

-fallibilist, since every item of factual knowledge is assumed to be fallible;

-meliorist for believing that all factual knowledge is perfectible; and

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-scientist in taking it to be true that the best approach to attaining knowledge, given the goals of science, is the scientific approach.

As well, this view holds that science produces symbolic representations of the world, that the concepts with which one tries to understand the world are our own inventions, and that every proposition or proposal should be justified by reason, experience, or (preferably) both.

1.42 The Background Knowledge is made up of:

- a specific background or collection of up to date and reasonably well confirmed data, hypotheses and theories obtained in other fields of inquiry relevant to the given science S;
- b) a fund of knowledge in S, the collection of up to date and testable theories, hypotheses and data compatible with the specific background (as above) and obtained in S; and
- c) a formal background or collection of up to date logical and mathematical theories available for use in S.

The inclusion of (a) and (c) as part of the background knowledge of (e.g.) linguistics points up an essential part of the initial success of TG linguistics: it incorporated the latest in theories (information from psychology processing) and mathematics (recursion and automata theory). It also,

however, implies that our view of linguistics should change in step with changes occuring in all the neighboring fields such as psychology, neurology and sociology. This is tantamount to saying that linguistics may be a separate field but it cannot be an its hypotheses, explanations and autonomous one: theories need to be in accord with the relevant parts of the rest of science for it, too, to be considered scientific.

1.43 Domain. Science must also be characterized by a Domain, or universe of discourse, composed exclusively of entities possible given the general worldview and the background.

The domain for any factual science is the reference class of its most general predicate, i.e. the class of concrete objects which that predicate can take as arguments, where the most general predicate is the one (in that science) that has the largest factual reference class, (see Bunge, 1974, Ch. 2 for further discussion and formalization of this notion of domain).

The General Worldview constrains the domain to the components, structure and environment of concrete systems, such as groups or societies of humans, neuronal macrosystems, ecosystems, etc., excluding such abstract entities as intuitions, grammars, and particular languages. Though this may sound bizarre at reasoning is clear: the first, the motions of 'grammars' and 'languages' are conceptual tools that linguists construct in order to study the laws of the objects in the concrete domain, thus they are not part domain of linguistics but, of linguistic of the metatheory. Though it is often postulated that there are grammars and languages that people have 'in their heads', these concepts are only tools (Min linguists' heads") with which the objects in the domain are studied, rather than the objects of study themselves. (We return to this in Chapter 2.)

The Background Knowledge also constrains the domain. Clearly, telepathic, gestural, or chemical communication are not usually included in the domain of linguistic phenomena. This is because the available background knowledge states e.g. that they do not qualify (in complexity, flexibility, or whatever) to the initial definitions of 'linguistic communication' or 'languages', which are also provided by the background knowledge specific to linguistics.

How can one define an object of inquiry? An object of inquiry, in this view, is a real-world (i.e. indirect, or mediate) referent of a (set of) theoretical proposition(s), and, of course, one of the members of the domain. Were this not true, then there would be no state of affairs in the world that could possible contradict the model. We oppose this real-world referent to the model object or object of theorization which is a fortiori an idealization or abstraction of the object of study. It is this that the theory refers to directly (immediate reference) and through it to properties of the real-world referent (médiate reference).

Since the object of study is concrete by definition, and the object of theorization (or model object) is an idealization also by definition, saying that people have grammars (model objects) in their heads (object of inquiry) confounds the two and leads to misunderstandings about the peferents of the theory.

1.44 Problematics. Science is also distinguished as such by a **Problematics**, or only those empirical problems (of measure) and theoretical problems (of explanation) of the nature (in particular the laws) of

the members of the domain, and problems concerning the other components of S. More specifically, scientific problems need to be well conceived (or meaningful) and well formulated (Bunge, 1983a, Ch. 7) :

A problem is meaningful in a given context only if a) it belongs to some approach including some methods (actual or feasible) capable of handling the problem, b) all of the concepts occurring in the problem are also present in the background knowledge of the field, and c) the presuppositions of the problem are compatible with the intellectual context, though it need not be compatible with all of the background (this makes room for novel or revolutionary guestions).

A problem is well formulated in a given context iff a) it is meaningful, b) if what is to be sought is indicated explicitly -- i.e., in more formal terms, the generating statement of the problem contains as many variables and guestion marks as unknowns, and c) the problem is atomic (or elementary) and either of the individual type (a problem about the arguments of the statement) or of the functional type (a problem about the predicates of the statement), or is a combination of atomic problems.

Another class of problem that goes to make up a science is that of self-réflexive ones, i.e. those that we have been calling metatheoretical. Note that in Bunge's formulation of the scientific approach metatheoretical problems are not considered part of philosophy but part of the individual sciences. This is in keeping with de Saussure's (1914: 20) own view that: "la tâche de la linguistique sera [aussi] de se délimiter et de se définir elle-même."

1.45 Methods and Aims. Moreover, Science is characterized by a set of Methods, or those procedures that strive towards the ideal of being a) objective, in the sense that they give roughly the same results for all competent users, b) checkable, i.e. can be checked. controlled by alternative methods. and c) or justifiable, or explainable (at least in general terms) with the help of some well confirmed theories or hypotheses. Finally, Science is defined as well by certain **Objectives** or Aims: the description, explanation and prediction of facts in the domain with the help of laws and data, as well as the refining of other components of that science.

The checkability of the methods of course rules

out introspection, but only as a method of verification of hypotheses (except, at best, when the hypotheses are about e.g. perceptions). Introspection, as well as kabala, LSD, I Ching, reading tea leaves or cowry shells, etc. can be used for generating hypotheses, but this notion of science will only take as acceptable the independently checkable methods for the verification of hypotheses, thus acknowledging Popper's falsifiability as only one criterion among the many characterizing science.

The objectives of a science are the description, explanation and prediction of facts in the domain. Description is a rather uncontroversial notion, so we will limit ourselves to discussing only prediction and explanation.

Prediction. As opposed to conjecture, prophecy and prognosis, prediction (Bunge, 1967: Chapt. 10) (i) is conditional in that it makes statements of the form "If conditions C are met, then P will occur," (ii) is based on theories, rather than vague hunches, mere generalization of experience or inspiration, and thus (iii) refers to properties of things (states or events) rather than things in their totality, and (iv) can be

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as exact as the laws upon which it is based and the information about the circumstances available.

this sense, then, the Neopositivists who In valued predictive ability of a theory were actually providing prognoses, since their other assumptions limited observation them to the of empirical generalizations and discouraged theorizing. In the "predictions" of transformational grammar as well, there is no prediction involved -- merely deduction from axioms and theorems, and moreover there is 'no reference to real objects (as in factual science) only conceptual ones.

Explanation. The notion of explanation in science that Bunge (1967, 1983b) espouses is one in which explanations need to be:

- a) explicit, i.e. they make as clear as possible what the account is saying,
- b) externally consistent, i.e. they are in keeping with the bulk of reliable knowledge from the rest of science, and

c) mechanismic, i.e. they attempt to answer how or by which means events happen.

Since these are different in part from the conditions underlying most of the explanations of this century (i.e. descriptiveness and systematicity), a short

justification is necessary, though much fuller treatment would be conducive to a fruitful and interesting discussion (see Bunge, 1983b).

.Central to Bunge's notion of the objectives of science, and most relevant to our discussion here, is that explanation be mechanismic, where he opposes mechanismic to descriptive and subsumptive explanation (1967, 1983b). In keeping with the neopositivist notion of science that dominated linguistics in the first half of this century, the linguist's task has been basically descriptive, i.e. one of organization of facts. This is part of the taxonomic view of linguistics against which Chomsky has .marshalled many well-known arguments that need not be repeated here (see e.g. Chomsky, 1959 and Katz, 1964). Chomsky's replacement for taxonomic linguistics, however, is less than satisfactory in this respect: his notion of explanation is the one called subsumptive explanation or simply subsumption (Bunge, 1967, sect. 9.3). This is the notion of deductive explanation that finds its origins in the form in which the modus ponens syllogism was revived in 12th century mathematics (Crombie, 1959, 3), and popularized by Hempel I: (1965) as the

"deductive-nomological" model of explanation. In such a notion, X, Y and Z are explained if there is some generalization or rule R from which X, Y and Z can be deduced; i.e. X, Y and Z are cases of generalization R. For example, if for language L one has the rule: R1: the last adjective of a string of one or more is always followed by a noun,

then R1 'explains' or 'captures the generalization' that

det Adj Adj Adj Adj Adj N is a grammatical sequence in L. There is, however, not much provided in the way of an explanation proper: 'X is a case of R, and R occurs in L'is a compact and explicit descriptive statement (a statement that this is the case) -- no account of how this is so is offered. This notion of explanation is modeled on the mathematical notion of proof, even though proofs do not seek to explain -- they are only demonstrations of the logical consistency of some mathematical proposition with a set of others. Moreover, such a notion of explanation, being based on strict deducibility, is not applicable to events involving probability, e.g. to genetically inherited explaining traits. grades obtained on examinations, atomic interactions, etc.,

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nor anything else that is not strictly deterministic.

1.46 Summary. To summarize, the notion of science we will be assuming -- Bunge's notion -- is made up of the following components:

- a) a **General Worldview** including a naturalistic ontology, a realistic but critical epistemology, and the ethos of the free search for truth;
- b) Background knowledge in the given science, in other relevant fields, and in logic and mathematics;
- c) a Domain, or the collection of objects that the science's theories refer to, and which is constrained by the general worldview and background knowledge;
- d) a set of **Problems** concerning the nature, especially the laws, of the objects in the domain, as well as those about the other aspects of the science itelf;
- e) a set of Methods, or a Methodics, that are objective, explainable and independently checkable; and
- f) a set of **Objectives** that include description, mechanismic explanation and prediction based on laws and theories.

In this view, then, for a field of study to become a science it must not only adopt the aims and methods of science (e, f above), but also seek to work on particular kinds of problems (d) within a specific domain (c) constrained by the general outlook of science (a), the specific background in relevant fields and the fund of knowledge from that field itself (b). We have adopted this view for our puposes because i) the others were found to be deficient in distinguishing science from non-science, i.e. because it is more descriptively adequate than the others, ii) it is explicitly and extensively developed, iii) it provides a framework within which to examine interdisciplinary relations around an object of inquiry, and iv) it recognizes and fosters principled interaction between science and philosophy.

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1.5 Conclusion.

Several views of science were described, each of which constrains the formulation of the object of inquiry in different ways and to varying degrees:

-The Consensus View rather unhelpfully restricts the object of linguistics to be whatever most people agree that it should be. In the case of linguistics, since there is no consensus, it leads us to conclude either that linguistics is a science with no object of study or that linguistics is not a science until such a time as some consensus is established.

-The Empirical Content View allows only for

observable objects of study, which would leave linguistics to study speech, language behavior, or e.g. measureable brain activity during speech. Meaning, knowledge of a language, hypothesized interactions of brain subsystems, mental rules and representations, etc. would, however, be disallowed.

-The Success View restricts the domain of linguistics to whatever yields practical results. We find it difficult to see how this restriction can be applied, since proponents of all views of "language" attribute success to their respective approaches.

-The Formalist view would, perhaps unwittingly, constrain the domain of linguistics to the mathematical or formal properties of "language," since they are the most amenable to formalization. Thus, logico-mathematical and probabilistic accounts would be favored over forays into areas that are difficult to formalize such as semantics, pragmatics, parts of syntax, morphology, etc.

-The Methodologists, in the case of Neopositivism, again restrict linguistics to observable speech and language behavior, or observable concomittant brain and muscle activity and would have

linguistics describe them in mathematical terms in order to formulate predictions rather than explain them. In the case of the Refutationists, linguistics would only be able to study testable hypotheses, though if they are to be "testable in principle" as some proponents of TGG read Popper (Chomsky, 1978: 9; see discussion in Botha, 1980), it does not serve as very much of a restriction.

-The Rationalist View of Science, as attributed to Chomsky, would constrain the domain to formalizable. phenomena couched in terms of mental states. Thus emphasis is reversed with respect to methodologism and empirical content view: (publicly) unobservable the mental states are to play a central role in description. and "explanation," where observable phenomena are to play the role of verifying the output-compatability of the resulting model. Of course, this emphasis on intuited mental states that constitute what the speaker. a language know" leads to problems of "must of testability -- the same problems that lead Itkonen (1978), Derwing (1973) and others to class TGG as a non-empirical enterprise. This, with the assumption of the autonomy of linguistics, i.e. that it need not

agree with evidence from other fields, make it an inadequate view for our purposes.

-Philosophism, or the Scientific Approach, would restrict the object of inquiry severely: it would have to be concrete, testable, conceived of as a system of brain processes (since it assumes materialism) influenced by social interaction (since it assumes ' systemism), nót grossly discontinuous with the evolution of signing systems in other primates (by the criterion of 'external consistency), etc. with the goal it well enough of understanding to formulate explanations as well as predictions and descriptions.

Adopting this view of science puts severe constraints the notions of "language" on and "linguistics" that can be consistent with it. However, these are accepted to ensure the explicitness and testability of the metatheory developed. This view also systematically relates the criteria by which we might choose from among alternative notions of "language," as well, thus providing an interconnected, explicit set of initial assumptions. The role of a domain defined in terms of the fund of knowledge and specific background is also brought to the fore, suggesting the emphasis on

both empirical results and philosophical assumptions in constraining and characterizing a given science's object of inquiry.

## NOTES: CHAPTER ONE

1. The content of this chapter owes a great deal to Bunge, 1982 and 1983a,b, from which we have freely taken material, often without indicating references directly. This note is in lieu of references that would have become cumbersome and distracting.

Bunge makes the distinction between factual and formal science in which the referents of the theories of factual sciences are concrete objects of the real world, whereas theories in formal science refer to conceptual objects, and are not directly verifiable with respect to events in the real world. Whenever we use 'science' tout court we will be referring to factual science.

## CHAPTER TWO

# NOTIONS OF "LANGUAGE"

"Les définitions du langage sont souvent considérées avec scepticisme: il suffit d'en rassembler un certain nombre pour donner le sentiment d'un grand désordre intellectuel. Mais un linguiste finit toujours par donner sa définition du langage, car chaque définition reflète le niveau atteint l'organisation dans de notre connaissance des choses, la description et le classement des faits, la délimitation du domaine, les critères utilisės."

(Mounin, 1969: 163)

## 2.1 Introduction.

Any notion of "language" entails the system of beliefs and views upon which it is based. Thus we will survey the different views we have found grouped by the -isms upon which they are based. A fortiori, this classification will be done by stereotyping some views, but for our purposes it will suffice, and it will at least provide more insight into the position being described than a mere definition or category label. This chapter, then, will simply be expository -- a listing of different views of "language", to provide an overview of the possibilities. We will consider these

views more critically in the following chapter.

Linguistics, for most, is concerned with a certain problem that can be schematized as did de Saussure (1914: 27):



Figure 2.1

I.e. linguists observe humans interacting linguistically through writing or speech (i.e. their output) and would like to account for this. How should they proceed? The most primitive assumption is that humans have some sort of mechanism as in Figure 2.2 below (ability, competence, knowledge, capacity) to speak and understand, and often to read and write, as well, and that elucidating this mechanism, it will be possible to explain what is happening.



output

(e.q. speech)

input

mechanism

Figure 2.2

It seems that all views of language ultimately assume the existence of such a mechanism, whether or they make this assumption explicit (see Teeter, not "language" as mental reality in 1964: 200 on Post-Boasian -- neopositivist! -- linguistics). The divergences arise, however, in deciding which initial assumptions to make about its nature and how best to go about finding out about it. As we began to appreciate in Chapter 1, the assumptions made about how to investigate the object of inquiry help (to greater or indicate some lesser degrees) of the initial assumptions about the nature of the mechanism. Thus, we will organize this chapter around three topics:

Epistemological Positions, or how to obtain

certain knowledge, and the views of "language" associated with them (sect. 2.1);

Ontological Positions, or those on the kinds of things in the world, for our purposes reduced to positions on the ontological status of mind, and the views of "language" derived from them (sect. 2.2); and

Ontogenetic Positions, i.e. those on how language comes about in the individual, and associated views of "language" (sect. 2.3).

All of these views contribute to a notion of language: by giving preliminary answers to questions such as "what kind of thing is 'language'?" "how can we find out about it?" and "how does it arise in the individual?" we define three dimensions of a philosophy of "language" on which to base its study.

In depth study of the literature on these issues is made difficult by the scarcity of explicit discussions dealing with them (they are usually tacit assumptions), and by the confusion of the terms "language" and "a language/particular languages". Many introductory texts have sections entitled "A Definition of Language" and go on with their definitions "A language is..." Examples of this usage are to be found

in: Lyons, 1981: Chapter 1; Mounin, 1969: 164-165, and many others, who do not speak of "language" at all, only "a language". We have come to understand such an apparent non seguitur as based on a construal of "language" as the universal of which specific languages are instances; thus "language" can best be understood in these contexts as "any particular language," or as languages" in contradiction human with the "àll standard interpretation of Boas (see Teeter, 1964 for a justification of this assumption). This is already based on, and reflects, a series of assumptions which we will go into below. We take the time to point it out hère so that eventual comparisons of definitions of "language" with others ostensively of "a language" can be understood as valid.

# 2.2 Epistemological Positions.

2.21 Epistemology. Epistemology is the branch of philosophy that considers problems of the nature of knowledge: what can we know? how do we know? what, if anything, does the subject contribute to his knowledge? What is truth? etc. Curiously enough, however, inquiry in this field since the advent of scientific psychology

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has taken little, if any, notice of the psychological research that bears on some of the questions above. At any rate, three epistemological positions will interest us here, and they are best understood as answers to the third question above: what does the subject contribute to his knowledge? Empiricism answers "nothing," rationalism responds "everything," and synthetic views such as critical realism reply "about half". Let us examine these positions in some more detail.

"language". 2.22 Empiricist views of The radical empiricist view is that experience is both necessary and sufficient for certain knowledge; as a result the knowing subject is a passive receptacle, a tabula rasa [blank slate] on which experience inscribes its wisdom. Most significantly put forth as a method for science by Francis Bacon in his Novum Organum (1620), this view was defended for psychological problems by Locke in his An Essay Concerning Human Understanding (1690). As well, it was a component of the positivist and neopositivist views of science, behaviorist psychology and, through them, the descriptive linguistics of this century. We can call the maxim of empiricism the principle of sufficient

experience, i.e. that experience is both necessary and sufficient for knowledge.

Empiricist views of "language" are construed here as those that emphasize the immediate observable reality of "language," i.e. the output of the -mechanism that is tacitly implied. The assumption, in its most radical version, leads to the view that there is no such mechanism, since we can't observe it. This counterintuitive extreme, however, has always been circumvented (see Teeter, 1964; Bloomfield, 1936) with assumptions of "eventual" brain correlates, of the possibility of characterizing the mechanism indirectly inductively by cataloging the universals of and observable linguistic form, or by other means. Thus, in spite of alarmist claims to the contrary, we have located a single proponent of not such radical empiricism.

The empiricist notions of "language" we did find, though, can be divided into those that refer to experiential data (sounds, noise, behavior and their properties) and those that refer to constructs (usually low-level generalizations) that are inductively related to such experiential data (habits, symbols, languages,

communication, etc.). As is to be expected, these are the most frequent in the literature we were able to examine: firstly because of the uncritical, prescientific (i.e. commonsensical-descriptive) approach that characterized much of the history of linguistics, and secondly because of the rise of empiricism (as part of heopositivism) in the first half of this century and its reflection in a great many textbook definitions.

Experiential data. In this category we find examples such as:

sounds: "A language is a structured system of arbitrary vocal sounds and sequences, of sounds..." (Carroll, 1953: 10).

behavior: "Languagé is personal behavior (...) [and] interpersonal behavior." (Herriot, 1970: 14-15).

social behavior: "Language is a form of social behavior..." (Labov, in Fishman, 1976: 152).

other: "Language is a set of events, activities, dispositions..." (Gellner, 1959: 21). as well as many others (Bolinger, 1975: 14, 16, 18; Bloomfield, 1933; Campbell, 1970: 19; Dineen, 1967, 6-10; Dixon, 1965: 2; Hockett, 1960; Kantor, 1977:42; Stackhouse, 1731:8;

Warfel, 1976: 29).

Generalizations. Inductive extrapolations from such experiential data lead to notions of "language" in terms of: C.

habits, e.g. "A language is a complex system of habits." (Hockett, 1958: 137). (see also Carnap, 1937 (in Lewandowski, 1973: 628); Chao, 1968: - 11; Skinner, 1957: 2; West, 1977: 195).

symbols, e.g. "To be language in" the generally accepted sense, the noises produced by the vocal organs must be meaningful and carry a definite, specific message..." (Pei, 1966: 4). (see also Bühler, 1933 (in Ströker, 1969); Garvin, 1977: 343; Pearson, 1977: 4; Hughes, 1962: 6; Brown, 1958: ix, etc.)

languages, e.g. "Language is a system of signals conforming to the rules which constitute its grammar..." (Greenberg, 1957: 1 -- it is subsequently clear that he is referring to the grammar of a particular language). See also Black, 1949: 43; Bunge, 1979: 181; Chomsky, 1957: 13; Firth, 1930: 16; WittgenStein, 1921, etc.

observable communication, e.g. "Language is the most frequently used and most highly developed form of

human communication" (Crystal, 1968: 30). See also Hall, 1968: 158; James, 1890: 683; Menyuk, 1971: 93; Moscovici, 1972: v, as well as numerous others.

The history of linguistics bears witness to the fact that with very few exceptions, this empiricist concern with the surface regularities of speech in different communities has characterized the entire history of the disicpline (cf. Dixon, 1965, Mounin, 1970 and especially Robins (1967) whose book could easily be re-titled **A Short History of the Study of Grammar**). This results in an equation of "language" with grammar, with particular languages, and an emphasis on description, usually at the expense of explanation and prediction.

2.23 Rationalist Views' of "language". The radical rationalist view is that reason is the source of certain knowledge; as a result the knowing subject is seen to have ideas that are born from within ("innate"), to which experience with the material world makes little contribution. We can call the maxim of rationalism the principle of sufficient reason, i.e. that reason rather than experience is necessary and sufficient for knowledge. Descartes' (1637) Discourse

on Method is the most important statement of this position as a scientific method, and culminated with the influential psychological theses of Kant's (1781) Critique of Pure Reason (see Klein, 1970 and Robinson, 1976 for his influence psychology) and the on Port-Royal Grammar and Logic (Arnauld & Lancelot, 1660; Arnauld & Nicole, 1660). Just as empiricism is the spontaneous epistemology of the man in the street, "because of the supremacy it assigns to analysis, theory, proof and discussion, rationalism is the spontaneous epistemology of most mathematicians and a great many philosophers" (Bunge, 1983b), and emphasizes that experience has to conform to theory. Where the empiricist seeks to characterize actual objects and propositions that are true, the rationalist seeks to characterize possible objects, and propositions that must be true, independently of experience.

Rationalist views of "language" are understood here as those that emphasize the cognitive or necessary a priori prerequisites of internal states of the mechanism, usually couched in terms of necessary "knowledge," "rules," etc. The assumption, in its most radical version, leads to the view that experiential

data are irrelevant, because more "direct" (usually preferred. This, introspective) means are to be however, needs to be attenuated to some degree, since it makes any sort of intersubjective verification impossible, and makes the only argument of relevance that from authority. Thus, again, we are not able to find instances of such extreme rationalism in the literature; experience is acknowledged by stipulating that (introspective, rationalist) characterizations be output-compatible with the object of inquiry: the human mechanism. This slightly less radicalized version of rationalism helps circumvent the problems mentioned above, i.e. allows for claims that rationalist characterizations are testable (an important criterion of gcientificity) but without creating any real constraints on theorizing. Indeed, an infinite number of models could in principle be formulated to be output-compatible to a greater or lesser degree with human speech behavior.

The rationalist views we encountered were divisible into the six categories outlined and exemplified below.

"Language" as software or rules. This underlies

many of the more recent approaches to studying "language": from AI (e.g. Schank, 1973) and the rules of competence (Chomsky, 1965, etc.) to the rules of thought (Fodor, 1975) and those for "organizing" behavior. This is difficult to distinguish from "language" as knowledge, but may be done, for expository purposes, by having this bategory include notions emphasizing "Knowledge now" and the latter include notions about an abstract "knowledge that". Thus, here we would find examples such as:

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"[A language] consists of whatever it is one has to know in order to communicate with its speakers as adequately as they do with each other..." "Goodenough, in Hymes, 1964: 37.

(see also Brown, '956: ix; Itkonen, 1978: 91; Langacker, '967 :'; Stross, '976: 3; Winograd, 1972, etc.).

"Language" as a mirror of the mind. In this category we will put the two extreme answers to the problem of how language and thought interact: language determines thought (e.g. Sapir, 1921; Whorf, 1956; Montagu, 1979: 173; Bloomfield, 1936; Hjelmslev, 1970: 3):

"The 'real' world is to a large extent unconsciously built up on the language habits of the group. (...) The worlds in which different societies live are distinct worlds, not merely the same world with different labels attached." (Sapir, 1929: 69).

and thought determines language (e.g. Boas, 19'': 23; Paul, 1886 (in Firth, 195 : 150); Tylor, 187' (in Firth, 1951: 50); Jakobson, 1972: 30; Hegel, 1807: 660; Yartseva, et al. 1977: 8; von Humboldt, 1836: 24; Chomsky, 1967, 1975; Dauzat, 19'2: 9; Beauzee, 1767 (in Chomsky, 1967: 30):

> "Language is, as it were, the external manifestation of the minds of peoples." " (von Humboldt, 1836: 24)

in both cases, "language" is a direct reflection of the nature of mind, and Chomsky, for example, appears to subscribe to a synthesis of the two. A subclass of the latter is the popular family of views of "language" as a means or tool of communication, i.e. it is subordinate to thought, thus determined by it:

> "...language may be said to be any means of expressing emotional or mental concepts by any living being or beings whatsoever..." (Gray, 1939: 13)

(see also Clark & Clark, 1977 39; Dauzat, 1912: 9; DeLaguna, 1927: 19; Katz, 1966: 98; Martinet, 1962: 26; Milton, 1644 (in the OED)).

"Language" as knowledge of 'a language. Here we are speaking of "knowledge that" and use this category to refer to authors who do not emphasize the pragmatic knowledge of how to use "language":

> "Competence [is] the speaker-nearer's knowledge of his language." (Chomsky, 1965: 4)

(see also. Fowler, '974:' 1; Goodenough, '1964: 37; Itkonen, 1978 9'). Here, too, we could include those authors who define "language" in terms of habits, since habits are assumed to be a kind of knowledge, but this would be misleading because it is a mechanistic, physiological kind of knowledge that has nothing to do with cognition, hence rationalism. Finally, we include those notions that couch "language" in terms of culture, since for one famous linguist,

> "Culture can be seen as the totality of the learned and shared ways human beings at various times and in various places have answered the universal problems of human existence in structured, interrelated, coherent and systematic ways." (Smith, 1976: 96)

The only other option for a "culturalist" like Sanders (1974: 12-13), since he doesn't see cultural objects as related to psychological objects, is to subscribe to a kind of social or cultural determinism that is separate

from any sort of psychological determinism.

"Language" as general knowledge or ability. Some authors couch "language" in terms of the capacity for learning specific languages:

> "[Language is] a general capacity of human beings to possess a communication system with certain specific properties (i.e. universals)." (Cairns & Cairns, 1976: 12)

and as such has something in common with the S-R assumption (see Staats, 1971) of an innate ability for general learning, though these authors phrase it in terms of a cognitive ability to avoid such an association. (see also Kess, 1976: ix; Williams, 1972: 1).

"Language" as a formal object. Probably a direct consequence of the formalist view of science and/or the "Galilean style" of inquiry, other authors see "language" as a mathematical or logical object:

> "Let S be a finite nonempty set, and o a binary operation is S. Further, call  $L=[S^*,o]$  the free semigroup on S\* (i.e. the set of concatenates of members of S). Then L is a language iff:

(i) S\* is a set of learned animal signals;

(ii) there is at least one animals capable of understanding some of the messages carried by members of S\*". (Bunge, 1979: 181)

(see also Bach, 1964 (in Lewandowski, 1972: 629);

Bar-Hillel, 1964: 87; Katz, 1982).

2.24 Synthetic Views of "Language". Though there were many different attempts to synthesize rationalism and empiricism. in different ways (in fact, the major proponents of these antithetical views (Descartes, Hume, Locke, Kant, etc.) made, to differing degrees, certain concessions themselves (see interesting discussion in Klein, 1970 and Robinson, 1976). For this reason, we are restricting this category to those views that propose a more equitable synthesis, i.e. that knowledge is a synthesis of (more or less) equalcontributions of reason and experience.

This might be the view of many of those who advocate the hypothetico-deductive method for science, though as the name implies, the hypotheses (rationalist aspect) are somewhat more important: the function of experience is only to help choose from among them. A more evenly weighted version is what Bunge (1983a,b) calls critical realism, i.e. that the progression from hypothesis to prediction to observation is actually a cycle in which all the subprocedures are equally essential. This is shown in Figure 3.1 in the following chapter. In sum, then, this is the view that a world

exists independently of our knowledge and we must make use of both reason and experience to understand it.

Synthetic views of "language" are by contrast with the positions already considered, much less common. They are characterized, in our understanding, by a certran compromise between those who emphasize, the psychological (rational) nature of "language", and those who emphasize its social (experiential) nature. There were, in our view, several formulations in which this position was, implicitly or explicitly, to be found.

Sounds and ideas. One well known view of "language" is that it is the association of sounds and sound-patterns with ideas. Formulated in these terms, no determinism (in either direction) shows through, and the role of observable sounds and unobserable ideas are accorded equal status. A typical example of this view is:

> "Language is a system which mediates, in a higly complex way, between the universe of meaning and the universe of sound." (Chafe, 1970: 15)

(see also Esper, 1973: 171; Hécaen & Albert, 1979: 12; Chomsky, 1968: 23, etc.).

De Saussure. Though he subscribes to a form of linguistic determinism (thought is unstructured before
entering, into a semiotic relation), his position that thought and sound interact on a more or less equal footing, as do knowledge and social experience, lead us to classify him in this group.

Halliday. By the same token, though Halliday himself does not recognize the importance of naving a psychological theory, his formulation of "language" in terms of choices or options invites a psychological interpretation. This, together with the importance he places on social variables in determining these choices, again invites construal as a theory of knowledge of behavioral options determined by experiential data. Interpreted in these terms, then, he becomes, even if unwittingly, a partisan of this synthetic epistemology (see Halliday, 1978).

Derwing's (1973) view emphasizes "language" as a psychological process, and as such amenable to empirical psychological investigation. Again in his view, such psychological processes are seen to be a synthesis of knowledge and experience, classifying him as another member of this group.

Bunge (1983c: Chapt. 1) defends the view that "language" is a construct -- a set of properties of complex brain systems in a social millieu. Thus, the linguist needs to study these brain systems to verify whether the statements made about the theoretical construct "language" are true. These are partially acquired and partially innate properties, and their study should proceed by synthesis of reason and experience, as well. All this qualifies Bunge's view as another of this category.

Saugstad. In a fascinating litte book, Saugstad (1980) shows how conceiving of "language" as behavior + or understanding (cognition) alone is inadequate, and provides a synthesis of the two; making "language" social interaction, biological function, communication; understanding and 'behavior. His emphasis on and synthesis of the innate and psychological as well as experiential and social aspects of "language" qualify his view for this category.

Other views. Other formulations of the notion of "language" do not make clear their authors' stance vis-a-vis the epistemological question consdiered here, but are based on other positions which we will discuss in the following sections.

# 2.3 Ontological Positions.

2.31 Ontology. Ontology is the branch of ŝ, philosophy that deals with the most general questions about the nature of our world and its contents. Ontological (or metaphysical) questions are those such What kinds of things are there? What are objects? as: Properties? Is the world made up only of concrete matter or is there also a separate realm of ideas? Clearly, these questions are not specific to any particular science but underlie them all. On the other hand, a science's most general 'questions (what 15 nature? mind? language? society?) populate the hazy border between very general science and very specific ontology (see Bunge, 1977a; 1977b).

The question to be addressed in this section, then, is what are some of the different positions on the nature of language -- what kind of thing is it? Is it a social, cultural, mental or physical thing, or a thing that is quite sui generis?

Since, as will be seen below, the points of view which class "language" as a social or cultural phenomenon do so based on certain theories of mind, since we can only make sense of the claim that

"language" is a mental phenomenon in the context of a specific theory of mind, and since those who construe "language" as material also do so based on certain views of the mind, for our purposes the ontological status of "language" can be reduced to the theory of mind subscribed to. Thus, in this section we will review the major solutions that have been offered to the Mind-Body Problem [fn 1].

There are two families of answers to the question of the relation between mind and body, or more to the point, between mind and brain: the monists and the dualists.

2.32 Psychophysical Monism. Psychophysical monists subscribe to the view that the world is composed of one kind of object or substance, whether it be only ideas, only matter or some other kind of substance from which mind and matter are derived. There are at least five monist solutions to the mind-body problem, as follows:

Mi Objective Idealism. Everything is mental. This is implicit in empiricist epistemologies (the world is what we know; we can only know what our senses tell us), and explicit in panpsychism (everything has

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mental activity, from electrons to nations, and differences in this activity set them apart).

M2 Neutral Monism. The mental and material are some neutral, third manifestations of TUST two substance (also called the "double aspect" view). It is understand what Russell (1921) difficult to 1 S proposing with this view, and other versions of neutral and matter as alternate monism that have mind manifestations of energy (Ostwald, 1910), for example, are equally difficult to unravel. None of these versions seems to have spawned either much of а following or notions of "language," though 'Ostwald (ibid: 86-101, 182) characterizes the essence of "language" as "the coordination of concept to sign" (p. 182). Both are reducible to physiology, which is in justurn reducible to energy and its transformations. The "information theory" views of "language" might be seen to fit in this category, but this is not so. The aspects of Shannon's (1948) mathematical theory of communication that were adopted by linguists were simply the key notion of "information," and the jargon they used.

M3 Eliminative materialism. There is no mind,

only physical states and processes; hence no mind-body problem. Radical behaviorists could be classed here, and this is one of the crude versions of materialism (also called eliminative reductionism) that Chomsky (1959, etc.) has fought so valiantly (and correctly) against. Notions of "language" in this view, are worded in terms of "behavior," "patterns of behavior," "sounds," "noise," etc. The similarity here with the empiricist position considered above simply indicates the compatibility of (epistemological) empiricism with an eliminative materialist ontology; this is what in fact characterized much of the work in behaviorist models of "language."

M4 Reductive materialism. There is a mind, but it is a set of physical states or processes, i.e. 'everything is reducible to physics, so eventually we will be able to explain "language" solely in terms of atomic interactions. Again, this is another of the views that generativists consider representative of materialism (see Fodor, 1975: Chapt. 1), though they are quite justified in arguing against this particular version. It seems that this view did not have much direct effect on linguistics since the problem of

reducing "language" to brain activity and from there to chemical and physical activity was not seen as part of the linguist's job. It may, however, have supported the implicit belief in some sort of mechanism that linguists were investigating (indirectly) with the conceptual and methodological tools they had.

This only one form of is reductionism physicalism -- but there are many others: panpsychism (everything is reducible to mentation -- "mentalism" is an unrelated view of explanation), biologism or animism (everything is biological), chemism (everything is chemical), and societism or culturalism (everything is social or dultural). In sum, reductionism is the "reduction" of the multiplicity of phenomena in the world to only one type and its derivatives. It is / common to speak, then, of "upwards" and "downwards" reductionism: reducing mind to biology or physics is downward; reducing it to a derivative of society (see e.g. Voloshinov, 1930) is "upwards" reductionism.

M5 Emergentist Materialism. Mind is a set of activities that only brain macrosystems can do, i.e. it is a set of emergent bioactivities. This is to say that systems of neurons have (emergent) properties that

their component neurons don't have, and larger systems have further new properties that the component systems do not, etc. In sum, mind is not a separate kind of thing, but matter organized in such a way as to have new, emergent properties. This view has not attracted enough attention from linguists to yield corresponding notions of "language," though some sketchy attempts have been made to do so (Bunge, 1983a, 1983c).

Emergentism is a kind of "partial" reductionism, i.e. the view that the mind cannot be entirely reduced to physiology, though many of its properties are so reducible (these are the "resultant" properties). This also holds for the other levels, as well: chemistry cannot be reduced to physics, society to individuals, etc. In Bunge's (1979) view, this position is linked with systemism, i.e. that everything is either a system or part of one and that the system has properties that none of its components have.

Of these monist ontological views, the last three represent materialism, or the view that only matter exists in the world, and that mental states and processes can be explained in terms of it. Notice that M3 and M4 open up the possibility of construing

"language" not as a thing but as a state or process, where M5 explicitly necessitates a view of "language"-as-process. These are other options for conceiving of "language" that are often overlooked.

The first two of these monist views permit (either instead or along side of matter) a separate realm of the mental, and as such can be classed, together with the dualist views we will survey below, as idealist ontologies.

2.33 Psychophysical Dualism. Psychophysical dualists, as opposed to the monists, hold that the world is made up of two different kinds of objects or substances: mind and matter. Again, there are at least five main ways of resolving the mind-body problem for the dualists:

D1 Autonomism, or the view that mind and body are independent entities that only seem to be related. Clearly this is not a popular view, in such a strong version, yet Bunge (1980a: 3) reads Wittgenstein (1948) as supporting it.

D2 Parallelism. This is the view that mental states have neural correlates, as opposed to the materialist view that mental states are neural states.

Some sort of parallel relation is supposed to exist, is not identity or causation. Though "neural that correlates" is one of the most frequent phrases in neurolinguistics, it does not seem that the strong parallel view (that mind and brain are independent, parallel and synchronous) is held. Unfortunately, most talk of "neural correlates" is not substantiated by more specific statements as to the nature of this mind-brain relation. It might be seen as a promissory note, but again for which view? "Correlate talk" appears to be more of an evasive tactic than a taking of opinions. In psychology, these forms of parallelism are called "cognitivism" and have been observed to suffer from several important problems (see Bindra, 1981).

D3 Epiphénomenalism. Brain states cause mental states. Here the position is that changes in brain states cause changes in mental states, though the reverse is not true.

D4 Animism. The mind directs the brain's activity, i.e. changes in mental states cause changes in brain states, but the reverse, again, does not hold. It is difficult to state any more exactly the theses of

D3 and D4, since they are usually assumed as axioms and neither developed nor justified. This view, however, is implicit in formulations of "language" that speak of it as "rules" or "standards for behavior" (see 2.12 above), since theoretically these mental rules would constrain brain states that would, in turn, control the articulators.

5 D5 The brain and mind Interactionism. are separate but interacting entities. Again, this is the entire thesis: there has been no further developmen't. Though Descartes (1644) postulated that it was the pineal gland that mediated this mind-brain interaction, no one else has put forward any sort of 'theory of the mechanisms or kinds of interactions that can take place in such a system (cf. Popper & Eccles, 1977). As well, subsequent testing has not borne out Desartes' hypothesis.

We have not been able to say very much about the dualist positions, but that is because their proponents have not stated much more than the central theses. This makes it difficult to formulate any notion of "language" in accord with them. There is, however, an enormous number of linguists who treat "language" as if

it were entirely independent of the brain and the people who produce it. Their stands on the exact nature of this independence are ill-defined, and for this reason they have not entered into the classification above. In this group might fall those who couch their notions of "language" in terms of "knowledge," "culture" (understood as 'shared knowledge), "rules,"

An alternative account is that linguists with such notions of "language" are simply methodological dualists, i.e. monists at heart but dualists by force of circumstances (the meurosciences are far from saying anything relevant, all that "brain stuff" is for neurologists, a science is implicitly defined by the methods it uses (methodologism) so we need to stick to our traditional methods, etc.). It begins to look suspicious however, when the neurosciences are considered relevant, along with psychological and other interdisciplinary research, only to tangential factors belonging to the battered and acused category of "performance" variables, though monists generally relish interdisciplinary corroboration of their hypotheses. As well, when Chomsky (1980: 218ss) speaks

glowingly of the Galilean method (see discussion in Botha, 1982), it is the same method that the Cartesians and other rationalists considered so highly as dualists (see Arnauld & Nicole, 1660: Part IV; Kant, 1781, 1800). This "Galilean" method, at least so it seems in Chomsky's reading, would have linguists construct complex mathematical systems of hypotheses representing what must be true of "language." Once this is formulated in "sufficient" detail, they would only then with sufficiently turn to the empirical data well-formulated hypotheses to make research worthwhile. Thus, linguistics should be concentrating its efforts over as many years as it takes to construct some "simple," "elegant" formal model for subsequent testing. In the meanwhile however, "language" is considered in а perfectly dualist manner (as independent from any knowing subject, or from brains or other matter) with all empirical evidence of dubious relevance during that period. The one exceptional case of relevant empirical evidence would be that which could bear on whether or not the formal model was producing the same "structures" as could be found in human output. But this is a prime example of the

position of parallelism described above, and as such is strikingly dissimilar from both Galileo's own emphasis on experimental science (see Botha, 1982: 16), and the approach most usually taken by monists, i.e. piecemeal testing of theories-in-development. The surest option for dispelling any suspicions of dualism would be for these "methodological" dualists to espouse some monist theory of the mind and how their hypotheses and constructs are to be related systematically to such an account. Since, of course, this is not forthcoming, we conclude that the so-called methodological dualists are, for all intents and purposes, ontological dualists as well.

The majority of the views that we have considered (M1, M2, D1, D2, D3, D4, D5) allow in their ontologies realm of mental objects, states ۰a separate and idealist processes, and these we will call the ontologies. This majority view may be accounted for to certain extent by the fact that idealism is an а integral part of the Western Weltanschauung: it is a central tenet of Judeo-Christian teachings that the "soul" is redeemed in a later existence where it exists by itself, that it "resides" in the body and leaves it

upon death; it was also an important part of the majority of philosophies that come to us from our tradition, and as such is ingrained in our manner of speaking, and our notion of common sense. For example, there are parallel sets of terms referring to body states and to mental states; and "language" is a noun an objective idea independent of any speaker (otherwise it could be an adjective or a verb). We are surrounded by such "common sense" as beliefs that libraries are full of knowledge, that knowledge is made up of facts that teachers can fill our heads with, that animals don't think (it's not that they don't have brains, they don't have souls), and, more recently, that computers do think, since that's what it looks like they're doing. Of course, not very much weight can be attached to these observations, but they do raise the question whether dualism of is ingrained just an and unquestioned traditional belief that originates in religious doctrine, or a hypothesis that can withstand the test of objective investigation.

2.4 Ontogenetic Positions.

2.41 Ontogeny. Ontogeny is the development of the

individual, and there are three main views: nativism, acquisitionism, and interactionism. To point up the parallel between ontogenetic and epistemological views, we can formulate the problem of ontogeny as "what is contribution environment's (physical, the to psychological, linguistic) development?" As was the case with the epistemological views, some will answer (nativists); "nothing" others "everything" "about half" (acquisitionsists), and yet others (interactionists).

2.42 Nativism. As was the case with very radical rationalist views of epistemology, nativism needs to be tempered with some environmental influence. After all, we speak the language of our environment, with the specific regional and social dialect of our millieu, etc. Thus the notion that "Ianguage" is mostly innate and need only be "triggered" by a limited amount of experience to mature.

This view once again favors formulations of "language" couched in terms of "innate principles", "a priori knowledge", "rules", etc., since we no longer believe, with Lamarck (1815; see McKinney, (Ed.) 1971: 19), that behaviors can be transmitted genetically.

Where more classical nativist views relied on a priori knowledge of innate ideas which 'were logical imperatives, more modern versions of this position resort to genetic transmission and have tried to formulate what would essentially be the "content" of the genetic constitution that would be transmitted. In conjunction with the rationalist epistemology also assumed by many modern nativists, the view of the child as "little linguist" becomes viable: the child is born with an innate language learning device and must simply hypothesize-and-test, within certain pre-established limits, to arrive at the grammar of a particular language (see Valian, Winzemer & Erreich, 1981).

2.43. Acquisitionism. This time in parallel with empiricism, with which it is closely associated, radical acquisitionism also needs to be tempered with some of the individual's contribution. It has to be recognized that different people learn more quickly or more slowly, but children's "language" develops quite regularly from child to child. Hence, the S-R assumption of an innate ability for general learning (see Staats, 1971). Thus, the child is born with the ability to learn, but needs agreat deal of experience

with his/her linguistic environment for "language" to develop. This view is not only inherent in the behaviorist's notions of "language" as "a set of habits", "behavior", "patterns of behavior", but also in other definitions that speak of "language" as being "culturally transmitted", i.e. acquired through experience.

2.44. Interactionism. This is the position that "language" development is predicated by a gradual and lengthy interplay of both innate, "language"-capacity-specific characteristics and experience with the physical, social and linguistic environments. This is the Piagetian view and dominates the child development literature in psychology and neurology. Parallel views seem to characterize biology and physiology. Unfortunately it is not often made explicit in the concepts of "language" found in the literature that this might be a viable position.

## 2.5 Conclusion.

In this chapter we have surveyed a wide variety of conceptions of "language" in relation to the general epistemological, ontological and ontogenetic theories

on which they are based.

"Such general theories form rough frameworks within which a number of specific theories may be developed (Bunge, 1980a). The broad frameworks or rough postulates are not specific enough to make precise predictions any [hence test against empirical evidence - MD]. The strategic question here is whether it is worthwhile developing ` a specific computable theory within a framework that is very possibly wrong even in rough approximation. Might it not be better to choose between rough frameworks before ' developing a rigorously computable 1981: 36, theory?" (Bindra, emphasis added).

In the first chapter, we chose a rough framework for the notion of science. In this chapter we laid out the options for making such a choice among rough frameworks in which to view the linguist's object of inquiry. In the next chapter we will attempt to characterize some of the problems inherent in opting for the different views while coming to a choice of rough framework.

#### Notes: Chapter Two

1. This discussion is adapted from that in Bunge, 1980a: Chapter 1.

## CHAPTER THREE

CHOOSING A PHILOSOPHY OF "LANGUAGE"

"Quel est l'objet à la fois intégral et concret de la linguistique?" (de Saussure, 1914: 23)

### 3.1 Introduction.

In this chapter we consider critically the various positions on "language" surveyed in Chapter 2. Given the view of science that we adopted in Chapter 1, many of these positions would be rejected by application of the internal consistency criterion. However, we will argue that they can be shown deficient on other, independent grounds, and only then check those that survive this scrutiny for consistency with the view of science adopted.

## 3.2 Choosing an Epistemological Position.

Empiricism. The principle of sufficient experience, the maxim of expiricism, proves to be `inadequate for several reasons:

Experience can be misleading. Our senses do not provide us with completely reliable data about the world: hallucinations, visual illusions, magic, and the cultural relativity of many observations should by

their very existence suffice to show that this is so.

Experience is insufficient. Without the formation of hypotheses, predictions and theories we would not be to perceive illusions, hallucinations, etc: as . able Moreover, we would.not such. be able to relate experiences, other than to class them as similar or not; description would be possible but explanation and i.e. understanding would, not. The cognitive simulation literature in AI suggests that there are very complex processes mediating between sense data and recognition (see e.g. Winston, 1975), and the physiological and psychological literature bears this out (cf. Hubel & Wiesel, 1963; Kaas, 1978).

Reliance on experience alone has not characterized the successes of science. From Aristotle and Galilei to Darwin and Einstein, a major component of successful science has been the fruitful marriage of experience with hypothesis and test. (see e.g. Wisan, 1978, cited in Botha, 1982: 45, n. 26).

Experience is insufficient for explanation. It seems quite unreasonable to assume that observation can lead to understanding without reasoning. Experiences have to be compared, understood and often manipulated

for an explanation to be given, whether it involves the postulation of spritiual, magical or natural causes.

As well, there is a great deal of empirical evidence that casts serious doubt on the independence or sufficiency of sense data: social psychologists have shown that group pressure can modify perceptions (e.g. Asch, 1952: Part V) and the notions of "psychological set" and "attention" reflect that perception is under some cognitive control, as is most clearly shown in Yarbus' (1964) OKN (ocular kinetic nystagmograph) studies of direction of gaze as a function of cognitive task. All of this argues for a strong interaction between cognition and sensation in the generation of perceptions, hence for the inadequacy of an empiricist view of knowledge.

Rationalism. Rationalism is also an insufficient vie for knowledge, for analogous reasons:

Reason is sometimes misleading. That the earth was flat and the center of the solar system were at one time strongly held views, and the list of other mistaken hypotheses could be extended indefinitely. Suffice it to say that what is believed at one time may, upon comparison with controlled experiment, prove

to be false, The objection might be raised that there exist so-called "innate" ideas that are not derived from the senses at all but are "eternal truths" of reason. The classical example is mathematics, in which it is always true that any number has one which is larger than it, and this is so without any reference to experience. However, the reasoning is circular: any such "innate" ideas are simply deductions from tacit " (previously postulated) axioms: those of mathematics. As such, showing that they are "true" is simply showing that they are logically consistent with the axioms from which they are derived. The circle of construct demonstrating construct is "eternal" in a logically consistent system, but is never broken by appeal to verification by any other than the same source that generated it in the first place. It is the same as saying that a dictatorial government never breaks the law: it is an "eternal truth", an "innate idea" since the government can generate laws from which it is always exempt.

Reason is insufficient. Because we can come to believe falsehoods, and fall into fallacious circular arguments, appeal to some other source of information

becomes necessary if knowledge is to be certain. Thus we find the appeal to experience in science.

Reason alone is not characteristic of the successes of science. The history of science is strewn with abandoned hypotheses and theories that were not borne out by experience. On the other hand, scientific revolutions, the most spectacular successes, were based on reasoning that unveiled new regularities in experience rather than new conceptual systems that had no bearing on experience.

Without recourse to experiend, radical rationalists can only produce hypotheses, not ' statements of fact. They are concerned with what "must be" in the logical, a priori sense, rather than with what actually is. Since they are not concerned with actual states of affairs in the world, they clearly cannot produce statements of fact, only hypotheses. This is why a tenet of "epistemological tolerance" is often associated with rationalist views (see Botha, 1982, sect. 2.4). The argument here is not that rationalism is false, but that it is insufficient in the absence of verification against experience.

The same empirical evidence that exist's showing

that empiricism is insufficient as a notion of knowledge, also demonstrates that human knowledge is insufficiently characterized as purely cognitive activities, i.e. that sensation and perception are involved as well. In sum, they show that experience is also an essential factor.

Synthetic views. These arguments lead us to conclude that only some sort of synthetic view will be tenable: experience can give us the raw data that we can evaluate and go beyond with the help of reason, that in turn has to be verified by experience.

radical rationalists, partisans of The less critical rationalism and the hypothetico-deductive approach to science (e.g. Medawar, 1969; Chomsky (see Cook, 1981), Popper, 1959), would contend to have -/ circumvented the main defect of radical rationalism, i.e. that it does not take experience into account, by making experience subservient to hypothesis. New knowledge is acquired by making hypotheses, deducing their testing consequences, and them against experience. This view, however, is descriptively inadequate because it does not recognize the role of observations, or assumptions for that matter, in the

formation of hypotheses (see Moles, 1956; Bunge, 1967). As well, adherents to this view often espouse some form of "epistemological tolerance," thus provoking a collapse (in practice) of "critical" rationalism with rationalism proper.

The position called critical realism, however, provides a synthesis of rationalism and empiricism that is also consistent with scientific practice. It weights reason and experience equitably and elucidates their relations as in Figure 3.1 below (from Bunge, 1967: 9).



Figure 3.1

#### 3.3 Choosing a Theory of Mind.

Idealism. The idealist views (M1, M2, D1, D2, D3, D4, D5) are substantially weakened at the outset by the

fact that there simply is no evidence for a separate realm of ideas, alongside that of matter.

The fact that idealism has such strong roots in tradition, in our view, makes it that much more suspect, since so many of our traditional beliefs have turned out to be erroneous after systematic inspection.

Finally, none of those who have proposed idealist views have accompanied them with theories of how to find the realm of ideas and test the properties of its organization. In a word, they all suffer from a vagueness that makes them impossible to test. These three observations already predispose us to consider these views more critically.

Dualism. Besides suffering from the same problems mentioned in connection with idealism, dualists labor under the problem of elucidating the relations between mind and brain. This, however, becomes extremely difficult, if not impossible, in the absence of any verified/verifiable theories of mind. Most of the dualist views consist of single axioms or doctrines that are assumed to be true and not usually developed any further. These doctrines inspire different lines of research that, unfortunately, are founded on the

vagueness of the initial postulates. If the axioms have no more than intuitive support, however, then the whole enterprise is to be regarded with skepticism.

In sum, that some dualist views may seem intuitively justifiable is not a position that we would disagree with. Nor would we say, at this point, that the dualist position is patently false, though we see some indications in the neuropsychological literature that this may be so. It fails, however, to be sufficiently testable for the more skeptically-minded scientist, and in this sense is unacceptable, unless there`is no superior alternative available.

Monism. Most views of monism hold dim prospects for providing an alternative to the impressively formalized and presently well-accepted dualist views.

Mi and M2 share the same problems of the idealist and dualist views, i.e. lack of evidence, vagueness, lack of testability, but offer no well-defined solutions to given problems so as to offset these difficulties. Energy is a property of mind or matter so it is misleading to try to make the latter types of the former (M2). It is equally unsatisfying to say that a car accident is a subjective experience; that the tree

the car hit was merely a mental state rather than an objectively existing material object simply doesn't agree with our intuitive view of experience (M1).

M3, by saying that there is nothing mental, rather than answering the question, avoids it. As well, there is no reason to assume that there is nothing mental. Quite the contrary, intuitive experience sugests very strongly (to the point of making idealism commonsensical) that mental experience does exist. This, again, is no viable alternative -- Chomsky (1959) provided devastating arguments that this is so for Skinner's (1957) version of M3.

M4 has a radical reductionist version, i.e. that everything is reducible to the properties of the objects of physics; and a more popular, weaker version i.e. that mental states are reducible to neuron states.

The radical version is patently false: chemical systems have properties that their component physical systems do not have (e.g. their composition changes in time), biological systems have properties that chemical and physical systems do not have (e.g. biosystems maintain homeostasis, reproduce, compete and cooperate with others of the same species, some subsystems may

control others, etc. -- cf. Bunge, 1979: 80), etc. Thus, when we reduce, e.g. a biosystem to its component chemical systems, the reduction is not complete, there are other, emergent, properties that have to be accounted for.

The weaker version, that mental states are reducible to neuron states, carries the weight of the many neurologists and neuroscientists who subscribe to this view, and the journalists who disseminate it. This is the view against which many of the dualists have concentrated much of their criticism (cf. e.g. Fodor, 1975: Chapt. 1), because it seems a viable alternative to dualism: most importantly because of the fact that dualists have to admit they don't know how mental functions are related to the brain, where adherents to this, version of M4 can justifiably say that great headway has been made in that direction.

Here again, it seems to us that the dualists are correct in saying that the weak reductionist view is not acceptable. One of the arguments is again that there are properties that neurons do not have: vision for example. Neurons simply do not see, nor do they hear, smell, control motor activity or carry out any

other "higher" mental functions. There is apparently a quantum leap separating neuronal activity from mental function, and monists have not provided, nor are they likely to provide, any evidence to show that vision, for example, can be explained entirely in terms of neurons. On the other hand, artificial systems can be programmed to perform similar tasks, so Fodor (1981) goes on to conclude that brain research is only tangentially relevant for studying the mind, at this time. The best alternative, for him, is to try to study ~ mental capacities in isolation from any possible substrate, as a form of organization described at a level of abstraction that makes no reference to the nature of the particular substrate.

This is how the situation is usually, and very eloquently, painted in linguistics: choose between a) the reductionism of the neurologist, which promises to say something about language in the very distant future, would have linguists study brains instead of languages, and is both counterintuitive and has not been shown to be true, or b) the dualism of the (cognitivist) dualists, which promises to say something about the brain (indirectly), would have linguists

study languages and their "mental representations", and has not been shown to be false. Of course, given this choice, it is easy to see why linguists opted for dualism and monist linguistics was soundly defeated. The materialist monist positions that were argued against with special attention were Skinner's M3, in which there was no mind to speak of, and the weaker version of M4 which reduced everything to neurons. At least the dualists left open the possibility of a non-reductionist answer to the Mind-Body problem.

Were this the whole situation, we would be left with three options:

a) however dissatisfied, stick with dualism for its present popularity, contributions and promise for the future;

b) somehow reconcile monism and dualism; or

c) work out a better monist view.

However, there already is an alternative approach that has appeared recently: emergentist monism (M5). It is an attempt to correct the problems with M4, and thus provides viable competition for the dualist view.

M5 circumvents the dualist's problems of idealism and relating mind and brain by making ideas properties.

of brains (for which there is suggestive evidence; e.g. Bechtereva, et al., 1979) and by providing a clear, testable (though not verified), statement of the relation between mind and brain (Bunge, 1980a). The monist's problems are avoided by rejecting reductionism in favor of emergentism, or the doctrine that when things of one kind form a system, the system has new (emergent) properties that its components do not, as well as the (resultant) properties of the components. Thus, in these terms mental states and functions are states and functions of neuronal macrosystems (systems forming systems forming systems, etc.) and for this reason can neither be reduced to states of individual neurons nor be attributed to some separate entity (see Bunge, 1979). Moreover, all of the evidence favorable to M4 is also favorable to this view as well because neuroscience has not progressed to the point where it can provide clear evidence against emergentism. At least in principle, emergentist monism is a better rough framework in which to approach "language."

We are left, then, with the ontological view of emergentist materialism, for which there are but sketches of what "language" might be like (see Bunge,

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1980a, 1983a, 1983c). The general view, however, is objective existence: that it does not have an "language" is a construct that refers to (does not have) set of properties of complex а brain systems-in-society. Of course, though this view has been concluded to be viable in theory, it is still. necessary to work it out in sufficient detail so that it may be adequately explored and tested in practice. It does, however, have the minimal criteria of clarity and testability to meet this challenge, as well as a principled account of how mind and brain interact. Faced with a choice between this view and the vague, untestable foundation of dualist views, the choice seems clear.

3.4" Choosing an Ontogenetic Position.

Nativism. Much as with the criticisms above, we argue not that nativism is false in attributing a central role to innate factors of language development, only that it is not sufficient.

The first counterargument here is that less radical nativists, e.g. Chomsky (1968), would also ascribe a certain role to contact with the environment,

i.e. triggering. Atsthis point, reference is made to the literature on imprinting in animals (see e.g. Whitaker, 1973, for a relevant réview). However, imprinting is associated .with animals that are much less altricial than humans, thus one can suppose that this is not a viable animal model for human learning. Moreover, it is not known whether the "triggering" period (for humans) needs to be on the order of days, months, or years; in the latter case the argument for triggering is vitiated, though it can be argued that different parts of the "language acquisition device" are triggered sequentially as the brain matures. This, though, seems empirically undistinguishable from the alternative view that the environment plays a greater. role.

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The basic argument against environment playing a minimal "role in language development is the neurodevelopmental one: human infants develop very slowly (compared to other mammals), and presumably this extended period of great neural plasticity is exactly so, that evironment can have a greater role than in less altricial animals (see Whitaker, 1973; Dingwall 1975). Clearly the analogy with walking and other such

functions is weakened by the fact that different functions are "prewired" to different extents and consequently admit of more or less adaptability to the environment (cf. the distinction between 'open' and 'closed' genetic systems.in Dingwall, 1975: 18). Thus, the "triggering" argument seems to run counter to the generalization that the "higher" the mammal, the more altricial it is, and the "higher" the function, the longer the nervous subsystem performing it is plastic, hence environment sensitive.

secondary view that usually accompanies nativism in linguistic discussions is the discontinuity hypothesis, which states that there is no containuity of communication systems as one progresses up the phylogenetic scale. Hence, studies of vocalization systems in monkeys and chimpanzees are not relevant for human language. Yet even the morphology of the brain is. very continuous; there are great differences to be sure, but the similarities are even greater. As well, Saugstad (1980) and Premack (1976) show that in man and other primates the perceptual and cognitive capacities that presumably underlie "language" develop guite continuously. Is there, then, some other evidence for
the discontinuity hypothesis or just a priori argument that humans should deviate so greatly from the regularities of evolution? Of course, there is the obvious difference that humans have "language" where other primates do not -- this, however, is no argument for discontinuity since birds have wings and dogs have tails and humans do not, yet they are related by a phylogenetic continuum. It seems that there is no evidence beyond Chomsky's a priori arguments that the discontinuity hypothesis must be so.

Finally, if the language faculty is to such a great extent innate and particular to humans, then why is it that no children have been found with congenital disorders that affect only the "language organ"? It would, needless to say, bolster Chomsky's argument greatly if "there were.

Acquisitionism. To take the opposite view is, mutatis mutandis subject to the same arguments, with the added caveat (see Chomsky, 1959) that it is extremely difficult for acquisitionists to account for the fairly regular course of "language" development or the fact that at most times during this development the child (or adult) is apparently prepared to produce and

understand many more linguistic forms than s/he has had experience with. Again, acquisitionism is not false, it is merely insufficient.

Interactionism. We are left with this view, since it synthesizes nativism and acquisitionism by attributing "language" development to fairly equivalent contributions of both innate and environmental variables. In favor of this view is. the neurodevelopmental literature on the development of perception and problem solving (see Cohen & Salapatek, 1975), and much other research.

Finally, we must check (as we will below) the consistency of the positions we have come to prefer (emergentist materialism, critical realism and interactionism) with the view of science that we adopted in Chapter 1.

3.5 Choosing a Notion of Language.

In order to be able to choose a notion or theory of "language" we need first make explicit the assumptions on which we will base such a choice. The kind of theory of "language" chosen also depends on what it is to be used for. Since here we are interested

in the metatheoretical issues of how assumptions, object of inquiry and conception of field of, study interact, we will want a theory of "language" to be able to illuminate how the different subfields of linguistics, as well as the different "language" skills (reading, writing, speaking, signing, understanding) interrelate. It should be made clear that such a theory of "language" does not exist and it is not our goal to provide more than a characterization of some of the constraints such a theory should satisfy.

These constraints are of two major types, both of which are components of judging the compatability of the object of inquiry with the notion of science: those of consistency with the general worldview adopted in Chapter 1, and those of external consistency, or consistency with results from other fields. Since the latter would be topic enough for several other volumes, we will restrict ourselves to a small aspect of it.

Central to the notion of science adopted here is the idea that explanations need be mechanismic. We will therefore examine some of the constraints on the nature of language mechanisms that the background knowledge offers. This will comprise Chapter 4. Here we will

conclude by considering the consistency of the views preferred with the general worldview. Of course, these are but two aspects of judging compatability of the object of inquiry with the notion of science -- we are simplifying by assuming that the object is consistent with the notion of science in all other relevant aspects.

To summarize, couching "language" in terms of physical characteristics of the speech signal, or behavior, or knowledge, or rules has been ruled out, as have those definitions expressed in terms of a means of communication, a mirror of the mind, or any particular language.

In keeping with the epistemological position preferred above, "language" must be something that necessarily involves the active involvement of both reason and experience to understand it. That, however, while it is not much of a constraint, it is more than those offered by alterantive views. In keeping with our notion of ontogeny, it must develop gradually but regularly, thus showing the influence of innate and environmental factors. Finally it must be construed as a (system of) brain processes, in keeping with our

emergentist materialist position on the mind-body problem.

Are these positions, however, in keeping with the initial assumptions made about science, in particular the general worldview that is one of its components? 7 The most important components of the general worldview, for our discussion, are:

a naturalistic ontology that is materialist, systemist and emergentist, and

a realistic but critical epistemology that weights equitably the roles of reason and experience in the acquisition of knowledge.

The ontological position we came by different means to prefer in this chapter has the same attributes of materialism, systemism and emergentism, so is very compatible. Had we, however, chosen the dualist alternative, there would be ill-defined "mental" objects to be included in the ontology, which would make it incompatible with the general worldview, hence with the notion of science.

The epistemological position arrived at in this chapter is also consistent with the worldview: it is realist in that it assumes a world to be experienced

and understood, and is critical in that it assumes that experience is not sufficient for reliable knowledge. Moreover, experience and reason were seen to be of equitable importance, just as in the view of science. On the other hand, if a rationalist alternative had been chosen, the concommittant emphasis on reason at the expense of experience would have created a conflict with this view of science.

This was the straightforward part of checking consistency, in this case quite **pro forma**. The next chapter will provide an idea of the complexity of checking external consistency. First, however, we should make this resulting notion of "language" a little more explicit.

## 3.6 Language.

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How are we to interpret this construal of language as a brain process? First, it implies that language has no existence independent of brains. More specifically, it is a construct -- a conceptual object -- that refers to a set of properties of complex brain systems. So, language does not refer to a thing, but to properties of specific things: brain systems. To

suppose otherwise would lead to idealism, which we provided grounds for rejecting above, and which would be inconsistent with the notion of science adopted.

Saying, then, that language is the object of inquiry is simply shorthand for saying that linguistic theories all refer, more or less directly, to a set of brain properties. This is just what Chomsky (1980) would say. However, since his theory of mind does not make the relation 'between mind and brain explicit, there is no concrete state of affairs in the world by which his hypotheses might be tested. Such testability is clearly based on making the term "language" refer to concrete states of affairs -- thus the options of speech and the brain. If however, the only concrete referent is speech, this entails the philosophical views of empiricism and descriptivism that we have found unacceptable on other grounds above: basically it restricts us to the description of appearances. The alternative referent of brain processes provides testability as well as emphasizing the importance of seeking the mechanisms that underlie the appearances we experience. However, the pitfalls of reductionism must be avoided by appeal to emergentism.

then, language refers to certain In sum, properties of a complex system of emergent brain system is partially processes. This determined genetically and partially by interaction of the system with the environment in the course of maturation. As well. activation of the thè system is context-dependent, i.e. both systemic and environmental variables determine the specific patterns of activation. This view is not very controversial, indeed it is similar to that which Chomsky advocates disguised competence and performance. However, major as differences arise between the two in their respective metatheoretical contexts: where chomskian dualism and rationalism make the claim indeterminate and untestable (see Botha, 1980), emergentist mentalism relates it more intimately with the rest of science, hence offering specific, testable alternatives. Admittedly, this is an extremely crude account of what is probably going on. However, in the absence of equally testable, more principled, more detailed and more sophisticated alternatives, this is what we have to work with.

What remains from this chapter is the view that existing definitions of "language" are inadequate for one or many reasons. However, it is not possible at this time to offer a satisfying definition of "language" that is compatible with the assumptions we have made. Instead, these assumptions point to a family of theories and an approach to finding the information necessary to "flesh out" the skeleton that we have provided. It is hoped that this approach will at least suggest how linguistics might escape from the facile dichotomizing that seems to have mired it in discussions of which of two equally unacceptable extremes should be championed over the other.

#### CHAPTER FOUR

### WHAT IS THE NATURE OF THE OBJECT OF STUDY?

"La langue n'est pas moins que la parole un objet de nature concrète, et c'est un grand avantage pour l'étude. Les signes linguistiques, pour être essentiellement psychiques, ne sont pas des abstractions; les associations ratifiées par le consentement collectif, et dont l'ensemble constitue la langue, sont des réalités qui ont leur siège dans le cerveau." (de Saussure, 1914: 32)

### 4.1 The Nature of the Question.

The line of reasoning in the chapters above leads us to take a construal of language as brain process as primary, and we have presented arguments suggesting that it is in fact an object of study that is more appropriate to the notion of science presented above. Here we will continue this with an inquiry into some of the more specific properties such a notion of language should account for. In this way we begin to examine its compatability with the existing background knowledge.

As seen in Chapter One, the notion of science adopted for our purposes here includes a materialist ontology called emergentist systemism (Bunge, 1979). In accordance with this, language is conceived of as a concrete system, exhaustive knowledge of which would comprise the following (ibid, p. 8):

- (a) the composition, environment and structure of the system (the delimitation/description problem);
- (b) the laws of the system (the mechanism problem); and
- (c) the history of the system (the evolution problem).

Clearly such complete knowledge is seldom attainable, but the completeness of any account can be judged by comparison with this ideal. Not surprisingly, the issues that have sparked most significant controversy in the history of linguistics are solutions offered to these pivotal problems (see e.g. Robins, 1965). It is these problems that have to be solved to give an account of the nature of the object of study. Here, however, we will only deal with the mechanism problem (b) because of the central role of the notion of mechanismic explanation in the view of Science adopted.

Since, as stated in Chapter 3, we want a notion of language that that reflects what speaking, understanding, signing, etc. have in common, then work about all of them will be relevant to our discussion. As well, in seeking a notion of language that is applicable to all the fields of language-related

research, we must examine models from several, as well. Reading research and AI models are of particular interest because these fields have seen more activity in the construction of process models than have those of human speech production and understanding.

## 4.2 The Mechanism Problem

The mechanism problem is the crux of the question of the nature of language, and attempting a solution to it is one of the criteria for scientific explanation. It is the problem of determining the mechanisms that underlie (and constitute an explanation of) overt language behavior, and the laws of their functioning. Though this has not traditionally been a problem dealt with by linguists, the 'philosophical and logical considerations we made in previous chapters argue that this is necessary.

Important to our discussion, then, will be to make explicit the notion of mechanism upon which we will base it. Consider the following as proposed explanations for the signing behavior of Nim Chimpsky (see Terrace, 1979, though not for these explanations):

a) he receives telepathic instructions from his

trainer or the experimenter;

b) something he knows allows him to sign;

c) he's hungry;

d) signing is innate in chimps;

e) he copies environmental prompts that the trainer produces;

f) he has formed a conceptual unit for e.g. yogurt (in inferotemporal cortex) from perceptual inputs, a sensorimotor unit for the sign (between inferior parietal and prerolandic frontal cortical areas) and a sensorimotor-conceptual link between projections from both (to the area of the sulcus principalis of the frontal lobe); the activation of this link caused the activation of the sensorimotor unit for the sign which caused the signing behavior.

(a) is a hypothesis compatible with the phenomenological data, but usually with no other.

(b),(c),(e) are too general; they are mere descriptions or stray hypotheses. (d) simply says mothing in answer to the question of how Nim signs. (f), however, is the closest to an account of the mechanisms, however superficial it may be, in that it satisfies the following conditions:

i) it specifies the inputs, outputs and other relevant variables.

specifies some of ii) it the intermediate (time-dependent) processes between the input and the output.

iii), it entails explanatory concepts from the immediately adjacent ontological levels (see e.g. Bunge's (1977) levels of the Great Chain of Being: the social, psychological, biological, chemical, and physical), but usually also entails concepts "that cannot be reduced to those of the inferior level but are emergent relevant to it.

(i) guarantees that the account will be complete; (ii) that it will not be too general, and (iii) that it will accord with the external consistency condition that we are assuming for all accounts (see sect. 1.45) as well as provide the account with some depth. (iii) also serves to foster interdisciplinary interaction and impede explanation of phenomena of type x in terms only of variables of that same (ontological) type, as is done in mathematics but becomes circular in empirical science.

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The shift of emphasis from description and

subsumptive explanation to mechanismic explanation in notion of science immediately entails the the inadequacy of at least two groups of characterizations of language: those in which it is characterized as a set or structure and some characterizations of language as a system as well. By the same token, this change lays increasing stress on the family of so-called process or dynamic models as a first step in the right direction. In the next section we will examine the notions of set, structure and system and several types of process models of language to see which of their properties a general notion of language will have to account for.

# 4.3 Set, Structure, System.

It is clear that qualifying language as a set is really of no use for tackling the mechanism problem, though it may be of use for the delimitation problem. The concrete entity corresponding to the (conceptual) set is the aggregate:

assemblage "An aggregate or is а collection of items not held together by bonds and therefore lacks integrity or either Aggregates be unity. can concrete (material). conceptual or A conceptual aggregate is a set. A concrete or material aggregate, on the other hand is a compound thing, the components of which are not coupled, linked, connected, or bonded (...) Because the components of an aggregate do not interact -- or do not interact appreciably -- the behavior of each is independent of the behavior of the others. Consequently the history of the aggregate is the union of the histories of its members." (Bunge, 1979: 3-4)

Whatever the elements of language may be, the most obvious thing that we can say about them is that they are interrelated in many and often complex ways. This, however, is not reflected by the concept of set, nor that of aggregate. A characterization of a chimpanzee as 'a set of organs, bones and muscles' (i.e. as an aggregate) may be useful in some situations, but is quite superficial: it tells us nothing about how the parts are related to each other, and even assumes that they do not interact appreciably.

On the other hand, describing language as a structure is to emphasize the relations between the elements while allowing the nature of the elements to remain obscure. This 'mathematical' approach of characterizing abstract relations between undefined

objects leads linguistics towards becoming a "formal (i.e. non-factual) science. This is fine if one considers that an account of language need only be internally consistent and not have anything more than output compatibility with real-world systems. Other structural approaches generally concentrate on concrete relations but only consider the static ones, omitting any dynamic interactions. As well, the nature of the relata is often neglected. Structure, then, is also unsatisfactory for an explanatory account, though it is an important part of the delimitation problem, since to characterize relations in any detail it is clear that the relata must be characterized in just as much detail. It is obvious that a 'structural' account of a chimp (i.e. the heart is in the thorax, between the lungs, above the diaphragm, in the ribcage, behind the sternum, etc.) provides us with the tools for constructing an explanation, but comes nowhere near providing the explanation itself. With such an account one still doesn't know what the heart does, nor what the lungs or ribcage are.

The next, and by far most popular, alternative is that of saying that language is a system (usually of

signs). Though many formulations of the notion of system reduce it to that of closed system (i.e. a set of elements plus their structure, whose interaction with the environment is  $\emptyset$ ), there are no closed systems in nature (Bunge, 1979: 246). The definition of system that was applied to linguistics was clearly one of a closed system, coming from popularizations of systems theory (e.g. "a complex of elements standing in interaction" von Bertalanffy, 1962: 68), where the more appropriate notion would be that of open system, a minimal model of which characterizes its composition, environment and structure, at a given level A (Bunge, 1979: 5-6):

> "The A-composition of a system at a given time t is the set of its A-parts at time t; the A-environment of a system at time t is the set of all things of kind A, not components of the system, that act or are acted on by components of the system at time t; the A-structure (or organization) of a system at time t is the set of relations, in particular bonds, among the components of the system, and among them and the things in the environment of the system at time t."

This notion of system allows for the integration of pragmatics, presupposition, deixis, sociolinguistics, etc. into a theory of "language", since the notion of environment (context, situation) is included. It also emphasizes important properties of language, i.e. that it is made up of units that can be related in various ways and that interact with properties of the environment.

Even this formulation of the notion of system, however, has a hidden problem. Mechanisms involve processes of elements changing in time, so must make explicit the dynamic nature of the systems involved in these processes. This, however, is not made explicit in either of these notions of system.

The important elements of a mechanismic model of language that can be singled out from these considerations are:

a) the components of the system (at a given level);

b) the static (e.g. spatial) and dynamic (temporal) relations that hold between them;

c) the static and dynamic relations that hold between the components and the environment; and

d) the static and dynamic relations that hold (indirectly) between the internal relations (b) and the environment.

The initial notion that seems most fruitful for

attacking the mechanism problem, hence explanatory theories, is that of language as an open, dynamic system of components that interact among themselves and with components of the environment. From approaches that have made similar assumptions, it can be seen that some general properties of this system have been fairly clearly demonstrated. The next sections sketch some of the properties of processes in such systems so as to provide some more information about the nature of the linguist's object of study.

### 4.4 Kinds of Processing.

4.41 Top-down vs. Bottom-up Processes. Up and down refer here to increasingly abstract or cognitive (knowledge-driven) processing and increasingly concrete or perceptual (data-driven) processing, respectively.

For bottom-up models of language processes, Gough's (1972) "One second of reading" is a texbook case: chunks of about 20 characters are perceived, then scanned for recognition of letters. The recognized letters are decoded into a phonemic representation based on which a lexical look-up is done. A "magician" named Merlin has access to syntactic

and semantic rules for deciphering what the words mean in the sentence, and this meaning is stored in "the place where sentences go when they are understood". There is no use of semantic or syntactic information to limit the lexical search or to facilitate word recognition. "[the Reader] really plods through the sentence, letter by letter, word by word" (ibid, p. is quite parallel to discovery 354). This the procedures that descriptive linguists developed for analysis of languages in the field: distinct levels, each analyzed in terms of the units of the level below, the analysis at upper levels not affecting that of the lower levels (see Garvin, 1978). Besides the fact that this model says nothing about important subprocesses such as Merlin, the fact that lower level analyses be constrained cannot from above leads, to combinatorial explosion of possible analyses (cf. de Beaugrande, 1980). As well, this model and others like it (LaBerge & Samuels, 1974; Geyer, 1970; etc.) encounter serious difficulties with ambiguous letters, and the effects of syntactic and semantic context on word recognition (see Rumelhart, 1976; Marslen-Wilson, 1976; etc.). Presumably, the same difficulties would

be true of similar models of comprehension of speech and signing, as well. This does not, however, rule out the possibility that such data-driven processes might be an important part of the story, though it is clear that they cannot characterize all of it.

On the other hand, other models, again of reading, such as that of Smith (1971) (see also Neisser, 1967; Kolers, 1972; etc.) are called top-down because

> "higher level processes interact with, and direct the flow of information through lower-level processes (...) the reader is only sampling textual information in order to test hypotheses." (Stanovich, 1980: 34)

In particular, Smith's model is based on Neisser's (1967) analysis-by-synthesis view of perception, coupled with Chomsky's (1965) transformational grammar. It is basically a "guess-and-see" (hypothesis & test) model in which hypotheses are generated from a TGG knowledge base occupying most of the reading process, and sampling from the text itself is only done to confirm these hypotheses. An unskilled reader may actually identify letters and words to get at the meaning, but the skilled reader can apprehend the meaning of the text directly ("immediate meaning

identification" Smith, 1971: 206), apparently by magic (no intermediate mechanisms or processes are suggested), though he still has recourse to the laborious "mediated meaning identification" method. Since this is based on Chomsky's (1965) grammar and the kind of cognitive psychology of which linguistics is said to be a part (Chomsky, 1968; Bindra, 1981), we are led to believe that this comes closest to what Chomsky believed to be a model of language (ca. 1968). This family of models, however, is thought to be based on some rather implausible assumptions about the relative speeds of the processes involved:

> "it seems unlikely that a hypothesis based on complex syntactic and semantic analyses can be formed in less than the few hundred milliseconds that is required for a fluent reader to recognize most words." (Stanovich, 1980: 34)

Recent experimental evidence, too, shows that fluent readers do not use conscious expectations to help with recognition word (Stanovich, 1980: 35), though McClelland and Rumelhart (1981)believe that unconscious expectations do play an important role in word recognition. Contrary to the prediction of the top-down models, poor readers seem to depend more on context (Stanovich, 1980: 47; see also Gibson & Levin,

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discussion 1975: 449-453 for of other analysis-by-synthesis models). The unconstrained hypothesis generation allowed by this model may also lead to a multitude of hypotheses underdetermined by the limited of "uncertainty reducing" sample information from the text. Again, however, there are. indications that such processes may form part of the total process.

The general question upon which the top-down/bottom-up distinction is based is that of whether or not knowledge is involved in perception. TGG-based processing models make the assumption that "all the elements in a string be simultaneously available for the manipulations and rearrangements derive its abstract structure" necessary to (Marslen-Wilson, 1976: 205), and thus that on-going word perception need not interact with linguistic knowledge. Marslen-Wilson (1976) offers results from experiments | of shadowing (a task quite like simultaneous translation but only involving repetition in the same langauge) that directly contradict this assumption, and McClelland & Rumelhart (1981) also argue against this view. Though one might argue, with

Seidenberg et al. (1983) that this is not necessarily so for initial lexical access or word recognition 'itself, they provide more evidence that this is so at an immediately post-lexical-access stage of processing. The conclusion is that

> "knowledge about linguistic structures is directly involved in on-line processing; that the listener interprets the syntactic (and semantic) implications of each word as he hears it, and actively uses this knowledge to guide his processing of subsequent items in the string." (Marslen-Wilson, 1976: 217)

This of course leads us to conclude that neither bottom-up nor top-down models alone can suffice: elements of both are necessary, just as we found in choosing an epistemological postion in 3.2 above.

4.42 Serial vs. Parallel Processing. Implicit in the bottom-up models that we have just considered is the assumption that processing is done level-by-level (phonemes, then words, then clauses, etc.) as it progresses. The alternative would be parallel or simultaneous processing at different levels, i.e. the input would be processed phonetically, syntactically, semantically, etc. at the same time. Problems arise with both alternatives.

Serial processing is time-consuming and doesn't

permit backtracking for reanalysis, except without including the information "learned" in the failure. Our visual field can take in about 20 characters at a time (Gough, 1972) and short-term memory can hold about seven chunks of information (Miller, 1958); what is to prevent parallel processing?

Strictly parallel processing does not allow for e.g. syntactic processing to help out with word identification; the processes are parallel but independent. It requires a larger amount of processing "resources", and that the processes be automatic, since so many things cannot be attended to at once.

Although there is evidence that we do not understand spoken language sound-by-sound but word-by-word (Marslen-Wilson, 1976), the assumption is in reading word recognition is based that on feature-by-feature analysis of letters (McClelland & Rumelhart, 1981), though Samuels & Eisenberg (1981) point out that the overall shape of the word may also be an important visual cue. Once having perceived a word, however, processing seems to become parallel, i.e. semantic and syntactic analysis are done before proceeding to the next word (Marslen-Wilson, 1976;

Seidenberg et al., 1983). This leads to postulating a mixed system in which all processing is done in a parallel fashion though the inputs are fed in serially.

Although input to and output from the language faculty are constrained to be basically serial (by a limited perceptual window or by the possibility of producing only one complex sound time), at а multi-channel capacities are also present, requiring parallel processing to follow the input in real time phones, pitch, intonation, context, (ex: etc.). Unconstrained parallel processing, however, leads to various unrelated products from the processors. It thus requires constraints on the ongoing processes whereby one can influence others.

4.43 Independent vs. Interactive Processes. Independence appears to have little that can be said in its favor with respect to the processes we are discussing here. It leaves the processes free to produce whatever results they can from the input in an unconstrained manner, leading, in theory, to an "information explosion". Interactive processes seem to provide a more reasonable view. Probably the best example of an interactive system is the HEARSAY II

speech understanding system developed at Carnegie Mellon University (see Lesser: et al., 1975). It is also a good model for tying together the pieces of this discussion, since it is both top-down and bottom-up, as well as working in parallel with serial input.

. The "raw" input for HEARSAY is represented at the parametric acoustic level as a digitized acoustic signal, and as further analysis occurs (at the segment, syllable, word, word-sequence and phrase levels) hypotheses are generated at the active levels and interact with hypotheses from other levels. То interact, the hypotheses are represented in a data structure called a "blackboard" where hypotheses at any level can reinforce or undermine the credibility rating of hypotheses at other levels, thus putting them higher or lower in the processing queue and eventually hypothesis with maximal yielding the overall Multiple hypotheses can be entertained consistency. simultaneously, and as new information enters the system from "below" or new hypotheses are made credible from "above", the constellation of "best" hypotheses changes.

This model is obviously inspired on

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analysis-by-synthesis (hyothesize & test) view of perception (Neisser, 1967) and the "pandemonium" of Selfridge's (1959) precursor of it (see Woods, 1982). From a linguistic point of view, the knowledge sources upon which hypothesis generation is based are derived from context-free finite-state grammars and the system apparently cannot parse for more powerful grammars (Woods, 1982).

The attractiveness of this class of interactive up-and-down parallel processing models stems from the characteristics we pointed to above, and they have attracted much attention (e.g. Rumelhart, 1976 and Arbib & Caplan, 1979). Rumelhart (1976) suggested a reading model parallel to that of the HEARSAY II system, with some improvements like an ATN parser which yeilds better top-down syntactic analysis. Stanovich (1980) provides an excellent, review of the experimental literature on reading to support Rumelhart's model, but enriches the model with his "compensatory processing hypothesis" which states that "a deficit in any particular process will result in a greater reliance on other knowledge sources, regardless of their level in the processing hierarchy" (p. 32). This makes

Rumelhart's model better able to elucidate individual differences in reading skill.

4.44 Source and Manipulator vs. Active Knowledge Models. The considerations above dealt mostly with 'peripheral' language skills, though there are implications for the nature of central language mechanisms:

> "...the processing system requires a representation that is organized for left-to-right access and codes the structural possibilities in the language in such a way that each words, as it is heard, is immediately interpretable in terms of the possible continuation of the string with which it is compatible." (Marslen-Wilson, 1976: 217-8)

By the same token, if the peripheral processing systems run in parallel, then so must the more central mechanisms. These must also be compatible with the give-and-take of up-and-down processing and most probably proceed in an interactive fashion as well. These are hypotheses that have yet to be subjected to adequate empirical testing, but seem to have prima facie validity.

Underlying the models we have discussed, indeed almost all psychological and AI processing models is the distinction between knowledge and use, usually in

the form of an assumption that psychological processes are based on a passive knowledge store and an active manipulator that controls the input and output of the store, or applies this knowledge to the data at hand. In the example of reading, there would be a reading center in the brain (or mind) that would draw upon that " reader's passive store of rules about his language and use them. This is what Chomsky often seems to have had in speaking of the distinction between in mind competence and performance. Accompanying this, for simplicity's sake, is the further assumption that the passive knowledge store is represented atemporally and in a context-free form. Since these assumptions form the very foundations of cognitive psychology and transformational grammar, it would be of great importance to know if they are valid assumptions to make.

This view yields sizeable methodological advantages, as can be seen in the possiblity of formalization of the contents of the knowledge source, and the simplification and abstraction this view permits. We will consider the three traits of this knowledge source (atemporal, context-free, passive)

individually.

Atemporal. Computations on formal linguistic representations are assumed to be based on specific features of the string as a whole, i.e. implying simultaneous access to the entire string, or its structural description. However,

> "This assumption of simultaneity of access is a legitimate one where the description of language as a formal object is concerned, but it is thoroughly alien in spirit to the dynamic use of knowledge that inheres in any real perceptual process." (Marslen-Wilson, 1976: 205)

> "The problem here for a TGG is not that it fails to capture the left-to-right constraints that hold between items in a sentence. The problem is that nowhere in interdependencies directly represented. It is the grammar as a whole appropriately related words to form sentences, as a function of the overall interactions of transformational operations with the organization of the underlying base strings." (ibid, 1976: 218)

The difficulty is that in processing a sentence word by word, the listener cannot use information presented atemporally; next-word transition probabilities must be calculated on the basis of available information on only part of the sentence. This may be one factor that contributed to the success

and popularity of ATN parsers for modelling understanding.

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Context-free. The rules of competence are supposed to be exceptionless and context-free. Exceptions and variable applications are taken care of by the performance component (the manipulator) which does so based on linguistic and extra-linguistic context. What is this assumption of a necessary division of labor based on? Are there other cases of psychological processing in which this is so? This view fixed, context-free base assumes that words have (competence) which meanings have varying interpretations according to context -- is this, too, a valid assumption? It seems that no empirical considerations have informed the adoption of a context-free/context-dependent division of labor, only formal considerations of simplicity. There do not seem to be any other instances of such a division in other psychological functions, though Seidenberg et al. (1983) interpret their work as indicating that lexical access is basically context free, and that only in subsequent processing does context become a relevant variable. Their work and that of Marslen-Wilson (1976)

show that the meaning of word-tokens is highly context-dependent (see also Anderson & Shifrin, 1980). However, there is no evidence that this distinction is a valid one for syntactic or semantic representation.

Passive. Implicit in the Source & Manipulator view of language knowledge is a source that is a passive repository of knowledge. By passive here we understand not the kind of passive memory in Morton's (1970) logogen model of the mental lexicon (to which we **take** no exception) but a memory that can only be accessed via the manipulator, i.e. that source and manipulator are two very different entities. Again, this is an adequate, indeed necessary assumption, if one is only considering the formal nature of language or producing a computer-implemented model. Is it, however, justified to assume that there is some such inactive storehouse of linguistic information in is no evidence humans? There in favor of the assumption. Quite the contrary, the ability of Morton's model to account for so much of the experimental data on word recognition/lexical access can be interpreted as indicating the opposite; that source and manipulator, if distinct, can hardly be distinguished.

In general, memory is not an empty container for which one needs an apparatus to enter and search for something, and by the same token, learning is not the process of filling it. Instead, it seems that learning is the establishment of a change in activation (pattern, connections, etc.) and memory is simply the recreation of certain patterns of activity that can be activated quite directly by environmental or other cognitive stimuli.

Indeed the most striking assumption of the Source and Manipulator family of models is that there is something besides knowledge of speaking and understanding involved in language. This very important hypothesis merits serious empirical investigation, with the burden of proof on the proponents of the more complex Source & Manipulator model.

Active Knowledge Models. We have seen that the assumptions underlying the Source & Manipulator family of models accord at best weakly with what is actually thought to be true of processing in psychological systems in general. How would the alternative conception be characterized?

The alternative "active knowledge" models would

have to contain an "active" representation of knowledge, and be contextualized and dynamic to be more keeping with what is generally in known about psychological processing. The notion of "active" here is simply the opposite of the passive knowledge of the source; a kind of knowledge that can be directly data-driven, as in Morton's (1970) model mentioned above, and implies that activation initiates a process, rather than resulting in a state. As well, this alternative view would emphasize dynamic processing, the contextual nature of knowledge representation, and, in doing so, the importance of on-line processing and pragmatic or sociolinguistic constraints on this processing. This is also in keeping with the notion of open system on which our ontological position is based.

Dynamic processing of serial input can be exemplified by the ATN (Augmented Transition Network) parsing systems (Woods, 1970; Kaplan, 1972) which proceed much in the way Marslen-Wilson's (1976) experiments indicated humans do, i.e. in a word by word fashion. The similarity ends there however, since ATN parsers only analyze syntactic characteristics of the input, whereas humans seem to analyze syntactic,
semantic and phonological aspects in tandem. Processing in both systems is facilitated by the knowledge of transition probablities between untis already processed and possible incoming units, as well as by contextualized representation of knowledge.

Contextualization of knowledge of language is knowledge is of the hypothesis that part context-dependent, i.e. that things are learned in certain situations (however abstract), and that these situations enhance the recall of this knowledge. The **ATN parser mentioned above gives a simple example of** this: in the context of a given string of words already parsed, certain properties of the following words can be predicted for example, their syntactic properties, meaning, etc. (See e.g. Chernov, 1979 for the role of predictions in simultaneous translation.) accords well with C.C. Fries' (1940)This also distributional definitions of syntactic categories, in terms of the sequences in which they could i.e. occur, and phrase-structure grammar's characterizations of a category extensionally, i.e. as a list of the possible strings belonging to that category. Note, too, that TGG's transformations were context-dependent,

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but that Fries, PS grammars and TG grammarians only considered formal linguistic context. This presupposes a definition of linguistics in which linguistic phenomena are those which can be described using propositions containing only linguistic variables (cf. Dillinger & Guilfoyle, 1981).

Studies in pragmatics (cf. Verscheuren, 1978) and sociolinguistics (esp. the ethnomethodologists, i.e. Schegloff, 1972; Sacks et al., 1974; Gumperz, 1982; etc.) have shown that when speaking to someone, people stay within registers (subsets of the tend to structures and vocabulary' of a language) and follow certain routines (question answering, greetings, etc.). These pragmatic, sociolinguistic, and other kinds of contextual information can all converge in limiting the possible structures and vocabulary used, making it simpler to forsee what class of structures the speaker might produce, and, hypothetically, facilitate speech processing.

Indeed, the question arises as to what kind of context-free knowledge of a langauge there might be. Of syntax? Though the notion of grammaticality is often context-dependent, some of the syntactic rules of a

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language are applicable in all contexts. Of semantics? Much as is the same with syntax, meaning is in the vast majority of cases to a great extent determined by context. That certain words have a much higher probability of meaning x than y is merely a question of frequency of occurrence and is not a counter-example to the contextual nature of meaning. Again, it is true that some words mean the same thing, or have some common denominator, but this simply masks the fact that in given situations different aspects of meaning are highlighted, while others are ignored, as is most exaggeratedly found in metaphor (see Ortony, 1980). It seems fairly clear that even if not all knowledge of language can be considered context-dependent surely the greater part of it is.

We know of only one (quite successful, though for a limited domain) attempt to model representation of knowledge from this view: MYCIN (see Davis, Buchannan & Shortliffe, 1977). This is a computer system for providing consultative advice on diagnosis and therapy for infectious diseases. The knowledge base of the system is represented in "production rules": multiple conjunctives that when true activate a process. In

general terms, we might express this as follows:

IF a & b & c & d & e & f, THEN do g. g, in turn, may help satisfy the conditions for other thus making them interactive. This rules, representation satisfies our criteria for an 'active' knowledge base: the resultant clause represents a process, not a state; the multiple conjunctions of the antecedent clause make the rule context-specific, satisfying our criterion of contextualization; the rules can be (and usually are) interactive; and the system is dynamic, since at time t, the values for the elements of the antecedent change as the situation changes. The striking parallels between this and Morton's (1970)<sup>4</sup> logogen model, and the success of both, seem to, indicate the fruitfulness of this line of reasoning.

This whole notion of "active representation" of knowledge, the opposite of 'the knowledge represented in a TGG's rewrite rules, is however, frought with methodological difficulties: how many are the minimal and maximal elements of the antecedent? (Davis, Buchannan & Shortliffe (1977) report that with more than six antecendents computing efficiency in their system decreases rapidly) What kinds of variables or factors should each represent? How to define the values each can take? Are there any such rules that require no antecedents/context? Can this serve as a framework in which to integrate interdisciplinary work on language as it seems to us? There are many questions, but this may be a sign of an interesting proposal.

### 4.5 Processes in What?

Clearly an account of the processes involved does not constitute an account of the mechanisms, hence it is not explanatory but descriptive, though it is an important step in the direction of an explanation. This is the distinction between kinetic and dyňamic accounts: the first is descriptive and includes the time variable, but makes no mention of mechanisms; the second is an interpretation of the first that includes hypothesized mechanisms the thus makes it and are full.of somehows, Kinetic accounts explanatory. somewheres, and somethings: the changes that are taking place are recounted without specifying the objects that are changing. In the more advanced sciences this is possible, even necessary, but it is

also well grounded in the sense that one has recourse. to theories of the objects that are changing, when necessary. In linguistics and information processing psychology, however, this is not so. There are mysterious representations and computations, cognitive structures and 'information, none of which is well defined for either field. It seems obvious that until we know how and where such events are taking place, we cannot know if they exist, much less provide an account of how they interact to produce any sort of 'language-related behavior.

Though the only place to spearch for the realities of these processes is in the brain, i.e. we assume (with Bunge, 1980a and a host of others) that all mental functions are brain functions, this does not entail that mental functions can be explained solely in terms of the properties of neurons. As we saw <sup>@</sup>in 3.3 above, they can not, but require the study of large, complex brain systems.

4.6 Conclusion.

In this chapter we have seen that though there are many process models of language available, of

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varying degrees of adequacy, there is no account that we can consider mechanismic. We can, however, indicate some of the characteristics such a model will have, and this is the point of the present chapter.

In answering the "what" question (i.e. What is happening?), a mechanismic model needs to incorporate a -detailed, explicit (descriptivé) kinetic or process model. This model should be include both top-down and bottom-up processes, the processes need to be interactive in terms of inputs and outputs, but independent and parallel in processing input that is serial, i.e. changing over time. For the moment, the simplest hypothesis is to assume that there is an active representation of language knowledge, rather than adopting the view of a passive store and an active manipulator.

In answering the "where" question, which often does not even come up in cognitivist<sup>®</sup> psychological models, especially those of the information processing approach, we must turn to the brain, to construct a dynamic (mechanismic) model. The vast literature from clinical neurology and aphasiology (now neurolinguistics as well) has begun to concentrate on

this question, in an attempt to find the neurological "structures" corresponding to the processes in answering the "what" question. Luria's (e.g. 1973) and Geschwind's (e.g. 1965) work have shown that an answer to this question will involve distributed processing and functional specialization of regions of the cortex. Lamendella (1977) adds to this the importance of the subcortical, especially limbic, areas, and Johnson (1982) follows Joanette's (1980) implication of the right hemisphere with a proposal to approach language as involving areas of the whole brain, without, however, returning to holism.

The "how" question, the very heart of the mechanism problem, has been left to speculation rather . than concentrated experimental efforts. Clearly it is both dependent on and a determinant of the answers to the what and where questions; the three evolve When it is stated that area A performs together. function F this is based on very circumstantial evidence: a model of what is going on states that F is necessary, and the clinical data show that when area A is lesioned, patients have problems with language skills that involve function F. The only way to

substantiate this claim directly is by explicating how A performs F. This would involve a sort of behavioral neurophysiology that has yet to be developed, though there are some simple animal models of the functioning of some parts of the brain (cf. Lynch. 1980). Rejection of the unsubstantiated assumption that language skills did not evolve from more primitive communicative skills in primates (Chomsky, 1968; see also Piatek, 1982) would open the door to further research' on the mechanisms of primate communication along the lines of Ploog (1981), Noback (1982) and others. For ethical reasons, this is the most direct, hence the most important area of research to be developed for an answer to the mechanism problem. Again, new brain imaging techniques hold great promise, especially in this area of research.

Some of the clearest advantages of following up the approach we have been outlining here is that in making the assumptions in Chapter 1 about the nature of science we make greater demands on linguistics. Along these lines, the object of study can be construed concretely, as explained in Chapter 3, thus providing an objective check on theorizing, and a push in the

direction of exploring mechanismic accounts. Finally, in this chapter, a small fraction of the kinetic or process models of languaging in existence were examined to show that fruitful work has been carried out along these lines, raising specific, testable questions about the nature of the mechanisms involved. It seems clear to us that couching questions about language in these terms makes them more amenable to study and suggests hypotheses for study. many Approaching psycholinguistic, sociolinguistic, and formal linguistic phenomena in terms of the common denominator that we have sketched here appears to be a condition qua non for fruitful interaction between these sine fields and of concommittant progress in the study of language.

# CONCLUSION

VIEW OF LINGUISTICS

#### 5.1 Introduction.

Ideally, a notion of linguistics would be firmly grounded on explicit theories of science and the object of inquiry. These in turn would have to be at least descriptively adequate in isolation and, taken together, should provide a view of linguistics that can account for the relations between the different subfields, and relations with other disciplines that study language processes and their products. This would be, as we defined it in the Introduction, a minimal metatheory.

We have considered several views of science and reasons for preferring one over the others. As well, we have examined several concepts of the object of inquiry and the arguments against and in favor of them. Finally, we have given reasons for opting for one of the views of science (Chapter 1) and one of the views of the object of inquiry (Chapter 3), as well as arguing that these choices are consistent with each

other.

Thus we have argued that the elements of the metatheory are independently valid. The last stage of defending this view lies in showing that together they generate a theory of linguistics which relates the different subfields as contributing to the elucidation of the same object of inquiry. This also argues more directly in favor of our initial assumption that there is a common object of study. Having successfully managed to carry out this last part of our argument, we will have presented a metatheory that is:

a) explicit,

b) systematic,

c) internally consistent,

d) to a reasonable extent externally consistent,
and

e) possessing some unifying power.

It can thus be seen as preferable over rival metatheories because these are, as stated in criticisms of their subcomponents above, almost always implicit, and even when explicit fragmentary, often conflicting (more or less directly) with established theories from other fields, and at best descriptively adequate with

respect to some properties of science, and lacking in unifying power. We have not been able to find an account of how, for example, generative linguistics would systematically reconcile and relate the various approaches to the study of "language". Let us, however, examine two implicit accounts of the interrelatedness of the subfields of linguistics to see this in some more detail.

### 5.2 Competence and Performance.

In addition to some of the other shortcomings of generative metatheory, it makes little attempt to show the relevance of the branches of linguistics to each other. Instead, there is a dichotomy between studies of "essence" of "language," its focal or defining the properties, and its residual or circumstantial properties. Thus linguistics is sliced into two parts: the maximally relevant (hence more prestigious) parts that study syntax, morphology, semantics and phonology (grammar or competence) and the tangentially relevant social, psychological, fields that attend to neurological and other variables (performance) which are constrained by the grammar, as in Figure 5.1 below:



#### Figure 5.1

As Chomsky quite correctly points out in several places, such a clear statement of relevance is a desirable, often necessary prerequisite for focussed research. It is a shortcoming of his metatheory, however<sup>6</sup>, that such a statement of relevance is given in lieu of, rather than in terms of a model of how different fields contribute different information to the study of "language." Moreover, relevance is

is relevant for the linguist goal-dependent: what writing a pedagogical grammar of Cree is very often not at all relevant for another who is studying the neurolinguistics of bilingualism. Thus, a systematic account of subdiscipline relevance presupposes a model of the relations between them, rather than an a priori dictum based on one researcher's immediate interests. It would, then, be just as inadequate to say that the "essence" of "language" is its place in society or culture, or how it is acquired or articulated, rather than grammar. These are dogmatic statements that seem to be used to avoid the more difficult problem of providing a model of linguistics rich enough to account for the various relations, and in terms of this model define priorities for given tasks.

### 5.3 Communicative Competence.

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Another implicit view of the interrelatedness of the areas of linguistic research is that found in Hymes' (1972) notion of communicative competence. In fact, each of its many variants (Campbell & Wales, 1970; Savignon, 1972; Canale & Swain, 1980; etc.) can be construed as indirect attempts to account for the structure of linguistics as an area of research in systematic rather than dogmatic terms. But, being implicit attempts, it is difficult, if not unfair, to evaluate them as such models.

Let us examine this possibility. Hymes (1972: 281) states that the speaker's knowledge of his language is made up of four components; knowledge of:

a) formal linguistic possibilities/

b) contextual appropriateness of linguistic . forms,

c) psychological feasability of linguistic forms, and

d) objective probabilities of occurence of linguistic forms.

Interpreted as an account of the structure of linguistics, it entails comparable relevance of formal grammar (a), sociocultural linguistic studies and pragmatics (b), psycholinguistics (c), and computational or mathematical linguistic studies of objective frequencies (d), as shown in Figure 5.2 below.



#### Figure 5.2

This, in our view, is an important factor contributing to the popularity of Hymes' position, even compensating for its significant weaknesses. In sum, fewer people are being told their work is irrelevant (or almost) to uncovering "the nature of language".

Chomsky at least provides an explicit, often detailed, view of how the components of his miniaturized realm of linguistics are related. Hymes, however, is content with listing the components. Each of the fields studying (a) through (d) contributes a necessary part, but its as if they were entirely independent, since we are not told how each influences or contributes to the knowledge of the other, and how they all contribute to a knowledge of "language". This is often the same approach 'that is taken in textbooks: there are all of these "approaches" or "aspects" of studying "language," but the students are rarely told how they are related. In choosing between Chomsky's view and Hymes', then, it is a simple matter to forecast how sides will be drawn up.

Neither view is adequate, though, because there are other approaches to the study of "language" to be taken into account, and the relations between them are not stated. Let us see whether the metatheory we have been developing here will be up to such a task.

5.4 Conclusion: The Science of Language.

Science has been construed, for our purposes, as an approach that involves a particular set of philosophical views (emergentist materialism, critical realism, systemism, etc.), hypotheses and theories that are in keeping with the bulk of knowledge from all the sciences, testable and explainable methods, all used to attack well-defined and meaningful problems in a particular domain in order to describe, explain them mechanismically, and predict them with the help of

laws. The role of these philosophical views in relating the different subfields of linguistics can be shown diagrammatically as in Figure 5.3 below (from Bunge, 1983c):



Figure 5.3

We have come to prefer, as well, a construal of the linguist's object of inquiry in which it is, most concretely, a system of systems of brain processes, partially acquired and partially innate, and determined systemic variables by internal and external environmental variables in its functioning. This view of the linguist's object of study may appear, at first, arbitrarily "conflate lingwistics to with the neurophysiology or neuropsychology of "language."

Granted, the centrality accorded to brain processes in this view may give this impression, but it is inaccurate, since these brain processes will be used as a means for tying together the other aspects of "language", i.e. as a common denominator. We will attempt to elucidate just how this is so, in what follows.

Linguistics of languaging vs. linguistics of languages. We find it useful for expository purposes to divide approaches to the study of "language" into those that attempt to study the mechanisms more directly (linguistics of languaging), and those that do so through the study of the output of those mechanisms (linguistics of languages). Lest one be led to believe that we will now take the position e.g. that the linguistics of languaging is to be favored since it is more direct, it must be said that it is fallacious to think in terms of one or the other. They are complementary enterprises: neither is sufficient in itself: The linguistics of languages may arrive at a. systematic, explicit, recursive, infinite, etc. set of formal universals, but it can never by itself go beyond characterizing mere appearance since that is what its

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الم وياني الم وياني data are about. The output is infinitely underdetermined with respect to the possible mechanisms involved, and is thus inherently limited to being the criterion of descriptive adequacy. The linguistics of languaging, on the other hand, becomes useless without the means (e.g. comparison of output) of establishing the equivalence or even the relevance of given brain processes to reading, writing, speaking, understanding, signing, etc.

This entails the view that all of the subfields are in error when they assume self-sufficiency, and may be called:

Postulate 1: The branches of the linguistics of languages are equal partners with the branches of the linguistics of languaging.

-- This can be accompanied by:

Corollary 1: The branches of linguistics are equally responsible for making their results compatible with and understandable to the others.

These two stipulations are tantamount to i) saying that there is a single object of inquiry that must be studied from several perspectives, ii) recognizing that all of the approaches to the study of linguistic phenomena have something to offer, to the

extent which they make their results compatible and understandable, and iii) incorporating the external consistency condition into the characterization of the field. This is easy to say, but it remains to be shown in detail how this can be done.

Languaging as brain processes. Central to this conception of linguistics is:

Postulate 2: that systems of brain processes are a viable point of convergence for theories of languaging and languages.

This is so for several reasons:

a) given our materialist assumptions, these systems of brain processes constitute the concrete, material reality that is the object of inquiry as part of the domain, as required by the theory of science subscribed to;

b) they are the direct object of inquiry of the linguistics of languaging;

c) they cause the output which the linguistics of languages seeks to describe, and thus their elucidation constitutes a mechanismic explanation of that output. By other accounts, the relation between languages and languaging remains veiled in obscurity;

c) considering them as open systems, in

accordance with the version of systems theory that constitutes part of the ontology, they are susceptible to influence from non-linguistic systems of emotion, arousal, perception, circulation, digestion, goal-generating systems, etc. Conceiving of all these systems as physical brain systems (of whatever complexity) makes it possible to relate them by natural laws, where envisioning them as distinct kinds of matter makes their relations a mystery.

d) implicit in (c) are the necessary building blocks for relating social variables: the perception and interpretation of others' actions in a given context that implies given expectations with respect to different goals are also interpreted as "higher" order brain processes.

Of course, to many this may not seem like a plausible course of action. It is however, a course that makes the relations between the branches of linguistics problems, rather than mysteries, to use the terms from Chomsky's (1975) rather pessimistic discussion. As well, there simply is no other alternative view that attempts to show, albeit in general and nonspecific terms, how all the approaches

to the study of "language" are related. Consider Figure 5.4 below to see how some representative fields might be pieced together in this system.



Figure 5.4

Here the relations between the notion of language

and the different subfields are more interactive and the grammar is accorded a secondary role: that of describing the regularities of a given language and in so doing pose questions to be answered by empirical research. Inter this diagram, the empirical fields are psychoneural and sociocultural linguistics which are separated only for expository purposes: ideal would be the study of brain systems that process sociocultural variables in given environmental contexts, thus fusing the two. These empirical branches of research would construct and elaborate the notion of language as a relevant contexualized psychoneural theory of the processes. Theoretical linguistics would study the formulations of 'language for consistency, hidden predictions, etc. and base its judgements on formal rather than empirical concerns. In this sense it would prove to be an interface between a body of metatheoretical knowledge and the theory building itself.

Most important here is that the feasability of using brain processes as the common denominator for couching the results of different fields in mutually compatible terms. The argument, in its outline, runs as

follows:

Perception of the external world, including social properties and relations, as well as of the internal world or physical states are carried out in appropriately specialized areas of the brain. Understanding and thought are carried out, to the best of our knowledge, by other specialized areas of the brain. Attention, motivation and emotion, which play central roles in language processing, are now seen as processes in certain brain systems. "Knowledge" of languages and of the world are "stored" in memory, again by appropriately specialized brain mechanisms. The "information" from each of these subsystems is presumably available in the form of patterns of inhibitive and facilitative neuron firings that are mutually "intelligible" from area to area. Knowledge from all these sources is necessary in producing or understanding language behavior, so such "information" necessary. Even if there exchange is are other imaginable common denominators for all these kinds of "information", none has as yet been shown to be as testable and so much in agreement with empirical research. Hence we are led to favor not the reduction

these different kinds of "information" to brain of states, but the elucidation and explanation of them in terms of brain states, otherwise there are no empirically justifiable and principled terms for comparison of data subfields, across hence no possibility of a systematic demonstration that the language-related sciences are studying related things, much less the same object, and no way of attesting to the consistency of any of the results from these fields with the body of well established scientific knowledge.

By the notion of science adopted, linguistics is either a science or autonomous, but not both. The question is one of choice. The approximation of linguistics to the established sciences holds out wonderful prospects of leaving the present morass of ill-defined and unsubstantiated notions, making rapid progress, creating reliable knowledge, and finding new relationships at every turn. The price is changing longstanding attitudes and preconceptions, and supplementing the new assumptions with lots of hard work. Future metatheoretical studies along the lines of this study could make the effort of showing the benefits and costs of this change in more detail.

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