Noam

CHOMSKY

Cartesian Linguistics

A Chapter in the History of Rationalist Thought

THIRD EDITION

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Cartesian Linguistics

In this extraordinarily original and profound work, Noam Chomsky discusses themes in the study of language and mind since the end of the sixteenth century in order to explain the motivations and methods that underlie his work in linguistics, the science of mind, and even politics. This edition includes a new and specially written introduction by James McGilvray, contextualizing the work for the twenty first century. It has been made more accessible to a larger audience; all the French and German in the original edition has been translated, and the notes and bibliography have been brought up to date. The relationship between the original edition (published in 1966) and contemporary bio linguistic work is also explained. This challenging volume is an important contribution to the study of language and mind, and to the history of these studies since the end of the sixteenth century.

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A Chapter in the History of Rationalist Thought

Noam Chomsky

Professor of Linguistics
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Third Edition

edited with a new introduction by

James McGilvray

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Contents

Introduction to the third edition
JAMES McGILVRAY *page* 1

Cartesian Linguistics 53

Acknowledgments 55

Introduction 57

Creative aspect of language use 59

Deep and surface structure 78

Description and explanation in linguistics 93

Acquisition and use of language 98

Summary 107

Notes 109

Bibliography 147
Index 154

Introduction to the third edition

James McGilvray

I An overview

Cartesian Linguistics (*CL*) began as a manuscript written while Noam Chomsky was a 35-year-old fellow of the American Council of Learned Societies. An early version of it was prepared for presentation as a Christian Gauss lecture on Criticism at Princeton University early in 1964. Perhaps because it proved beyond the audience, it was not delivered, and Chomsky presented a general lecture on linguistics as understood at the time. The manuscript, however, was revised and published in 1966. An intellectual tour de force, *CL* is not an easy text to read, but it is certainly a rewarding one. It is an unprecedented and – so far – unequalled linguistic–philosophical study of linguistic creativity and the nature of the mind that is able to produce it.

CL begins by describing the sort of linguistic creativity that is found with virtually every sentence produced by any person, including young children. As its subtitle ("A Chapter in the History of Rationalist Thought") suggests it will, though, *CL* soon turns to focus on the kind of mind that is required to make this sort of creativity possible, and on the best way to study such a mind, and language in it. The seventeenth-century philosopher René Descartes figures prominently in the discussion and the book's title. This is because he was among the first to recognize the importance of this 'ordinary' form of linguistic creativity – creativity exhibited by everyone, not just poets – for the study of the human mind.[1] Because of this, and because a group of linguists and philosophers who came after Descartes shared his insight (even though they might have disagreed with Descartes in other ways) and directed their study of language and the mind towards dealing with the issues it posed, Chomsky titled his study of their work and of their opponents' *Cartesian Linguistics*. Those who Chomsky thinks can plausibly deal with the issues that linguistic creativity poses for the study of mind and language he calls "rationalists"; those who cannot, he calls "empiricists." In this introduction I add 'romantic' to Chomsky's label 'rationalist' to emphasize what is implicit in a study of ordinary linguistic creativity and its role in human thought and action: that the rationalists of interest to him, like the romantics he focuses on, recognize the

centrality in everyday life of freedom of thought and action, and they try with their view of the human mind to speak to how this creativity is possible. For many of them – and certainly for Chomsky in particular – the nature of language itself as a component of the mind/brain plays a central role in the explanation.

Cartesian Linguistics has many assets. One is that it places Chomsky's effort to construct a science of language in a broad historical context. It does not pretend to be a work in intellectual history; it is too brief and too selective in the individuals it discusses for that.[2] But it does offer important insights into the works of historical figures, and uncovers and discusses often-ignored but clearly relevant historical texts. It also revitalizes a rivalry that has lasted for centuries and that – in 1966 and still now – continues in the cognitive sciences.

Another asset is the understanding it gives of the basic observations that lie behind Chomsky's – and other rationalist–romantics' – research strategy or fundamental methodology for the study of language and mind. There are two sets of observations. One – the "poverty of the stimulus" facts – focuses on the gap between what minds obtain when they acquire a rich and structured cognitive capacity such as vision or language and the small and 'impoverished' input that the mind receives as it develops the capacity. Another – the "creative aspect of language use" observations – focuses on the fact that people, even small children, use language in ways that are uncaused and innovative, while still appropriate. Because of its extensive discussion of linguistic creativity, *Cartesian Linguistics* focuses more than any of the rest of Chomsky's works on the creativity facts, and explores their implications for the science of mind and the explanation of behavior – and it touches on their broader implications for politics and education, and even art – especially poetry. By describing a form of creativity that everyone exercises in their use of language – a creativity that figures in virtually all thought and action where language figures – it highlights a common phenomenon that seems to defy scientific explanation. Humans use language creatively routinely, yet this routine use seems to be an exercise of free will. If it is, it would hardly be surprising if the tools of science, which work well with determination or randomness, fail to describe or explain the use of language. Free actions are uncaused, hence not determined, yet they are nevertheless typically appropriate, hence not random. To Chomsky, as to other rationalist–romantics, this suggests that if you want to construct a science of mind and language, you should avoid trying to construct a science of how people use their minds, and especially their language. Do not try to construct a science of linguistic behavior. Perhaps, in fact, given the degree to which language infuses and shapes so much of how we understand and act, do not try to construct sciences of action and behavior in general.

This is *not* to say that one should not try to construct a science – in fact, many sciences – of the mind. And it did not stop any of the rationalist–romantics – with the partial but puzzling exception of Descartes[3] – from trying to construct sciences of mind and language.

After all, the poverty of the stimulus facts for language and other domains, such as vision and facial recognition, suggest that there can be sciences of at least some components of the mind. They seem to indicate that the mind is made up of innate systems that grow automatically, much as do the human heart and liver. Adopting such a research strategy is called "nativism"; rationalist–romantics are *nativists*. Adopting this strategy, Descartes to an extent aside, rationalist–romantic strategists aimed in one way or another, and with different degrees of success, to offer species-universal, objective theories of various components of the mind, components of the mind that the tradition called "faculties." Mental faculties – we would now say "modules" – do seem to work determinately. Or at least, rationalist–romantic efforts, such as Descartes's ventures into a computational theory of vision, the Port-Royal grammarians' efforts to produce a Universal ("philosophical") Grammar, Cudworth's speculations about the nature of "an innate cognoscitive power," and von Humboldt's effort to deal with the mental machinery needed to provide for creativity, have managed with varying success to deal with aspects of deterministic sciences of various faculties. Progress has been much greater since the mid-1950s. David Marr and Chomsky and their co-workers have produced advanced nativist sciences of vision and language. Their obvious success – and the more limited successes of earlier rationalist–romantics – seems to indicate that it is possible to construct sciences of various parts of the mind/brain, although not of the ways in which humans use what these components provide them to deal with the world and otherwise solve various problems.

The very real risk of failure when one tries to go outside the head to deal with the complexities of human action and behavior suggests that the scientist of mind should focus on what is 'in the head' and how what is in a particular person's head comes to have the shape and 'content' that it does – how it 'grows'. Chomsky's term for this strategy for the study of mind is "internalist." In addition to adopting nativist assumptions, rationalist–romantics adopt an *internalist* approach to the sciences of mind. Linguistic creativity observations seem to suggest that this is the only one likely to prove fully successful. Of course, some of the evidence for a science of what is in the head (although by no means all) comes from observing how a person behaves – in the case of language, how a person pronounces a sentence, and when and where s/he uses it, among other things. But, obviously, an internalist theory of what is in the head is not just a compilation of this or any other kind of evidence; the theory is concerned with what really is in the head and how it works. It is concerned with the principles of operation of a faculty/module, with its internal

inputs and outputs, and with how this faculty develops and grows as the organism develops. It does not follow, by the way, that the rationalist–romantic theorist's nativist and internalist approach to the mind has nothing to say about creative linguistic behavior and action. For as suggested above it can – and does – account both for what in the human mind makes linguistic creativity possible, and for why linguistically informed creative behavior is available only to humans.

In recent years Chomsky's label for his approach to mind and language has changed from "rationalistic" to "biolinguistic." He and others working in the field are now called "biolinguists." The label change highlights a characteristic of Chomsky's efforts to construct sciences of language from the start of his work; the aim has always been to try to accommodate the science of language to some natural science, thus biology – for biology alone can explain how language is innate, why it is unique to humans, and how it grows. Nevertheless, biolinguistic research strategy is just the rationalist–romantics' nativist and internalist strategy updated. The same poverty and creativity observations continue to be honored. Rationalist–romantic (RR) research strategy is alive and well in the practices of biolinguists.

A third asset of *Cartesian Linguistics* (*CL*) is that it points to the central role of linguistic creativity in almost all human affairs. Unlike organisms that lack language, we can and do think and talk about anything, anywhere; we speculate and wonder, question and doubt, organize ourselves in non-kin and non-contact communities, cooperate to carry out projects, live and thrive in many environments, engage in fantasy and play, and so on. Our cognitive capacities in general are much more flexible than those of other creatures. We can adapt to various environments and solve (and create) problems well out of the range of any other kind of creature. We can make and interpret art, develop various forms of religion and the kinds of explanation they offer, develop ourselves and our cultures. Linguistic creativity surely has a central role to play in all this, and the operations of the language faculty in making possible this central feature of what makes us human – giving us our distinctive human natures. The implications of this gift were not lost on A. W. Schlegel or von Humboldt or, following them, Chomsky. Some are political. I discuss some of these briefly in another section of this introduction.

The introduction has four parts. In the next, Part II, I discuss in more detail the place of the rationalist–romantic view of the mind and its study in Chomsky's work, and explain how this view, and along with it his science of mind, have developed since 1966's *Cartesian Linguistics* to become contemporary biolinguistics. I also contrast it to the empiricist view of the right strategy to use in investigating the mind, focusing on some of empiricism's contemporary versions. One of my aims in this part is to emphasize the importance of taking Descartes's creativity observations seriously. Doing this while also taking

seriously the poverty of the stimulus observations leads – I suggest – to the remarkable progress seen in recent years in the scientific study of mind and language. Part III focuses on Descartes and his contributions and failures. The other, Part IV, takes up briefly some of the implications of biolinguistic study of language and mind for politics and education.

Readers might want to read Chomsky's rich text right now, and return to Part II to learn more about the RR strategy for the study of mind, and about progress in Chomsky's approach to language since 1966. Alternatively, they might want to read Part II now to get an overview of the RR research strategy and why it seems to lead to progress in the science of mind where empiricist strategy seems to fail. Parts III and IV are for those who become curious about Descartes's specific contributions, and about the implications of an internalist and nativist research strategy for politics and education.

This third edition of *CL*, like an earlier second, is in English alone. In the original 1966 text, Chomsky left many quotations drawn from the works of those he discusses in French or German; for the most part, he used translations only if they were available at the time.

To make the second edition more accessible to the wider audience *CL* deserves, Susan-Judith Hoffmann translated the texts in German that remained, and Robert Stoothoff the parts that remained in French. Most of the French translations of Descartes's works that Chomsky had included in the original have been replaced with improved ones from later translations – specifically, those available in volumes 1–3 of John Cottingham, Robert Stoothoff, Dugald Murdoch, and (for the third volume alone) Anthony Kenny's Cambridge editions of *The Philosophical Writings of Descartes*. With all translations, an effort was made to suit both the original text and Chomsky's terminology. Sometimes this required minor modifications in available translations to make clear what Chomsky seems to have seen in the untranslated originals. I cannot – no one can – guarantee that the translations or changes exactly capture what the original texts intended, of course, but the overall result meets, I believe, the demands of both scholar and student, thanks to Professors Stoothoff and Hoffmann's admirable work. Finally, I thank a former graduate student (now professor), Steve McKay, for his work in the preparation of an index for the second edition; the original had no index at all. The current index modifies McKay's to accommodate this introduction.

Note the following conventions: Chomsky's endnote numbers continue from those of the new introduction. Editorial additions to Chomsky's notes appear in square brackets ([…]); for the most part, these additions offer suggestions for further study. Chomsky's references to texts and pages remain as they were in the original; all additions have the form (Author, date of publication: page). I added bibliographical items dated after 1966.

Noam Chomsky read this introduction early in 2008 and sent me many useful comments. I am very grateful; his comments led to several changes and improvements. In two places, I simply quoted what he had to say. I am also very grateful to Cedric Boeckx, Oran Magal, and Juhani Yli-Vakkuri for reading drafts of this introduction. I don't doubt that errors remain. They are, however, entirely mine.

II The science of mind and language

II.1 Creativity and poverty: internalists, nativists, and their opponents

Rationalist–romantics (RRs) and empiricists differ a great deal in their views of the mind and – not surprisingly – in their views of how the mind should be studied. They differ both in how they conceive of the mind having the 'shape' and content it does, and in how they conceive of the role of the world outside the head in shaping and giving content. Empiricists claim that we *learn* much of what we get – at least, when it comes to 'higher' concepts and cognitive processes. RRs disagree; these are mostly innate.[4] Comparing these views highlights the features of each, and allows us to ask which view, and which research strategy based on that view, has the best prospects of success.

To illustrate their differences, let us look at how each camp conceives of two kinds of mental entities and how they come to be in the mind – how they are acquired or learned. One class consists of 'atomic' concepts such as WATER, DRINK, COLD, and thousands of others that we use in various ways to carry out various cognitive tasks, such as describing, speculating, reminiscing, telling stories, etc. The other class of 'entities' consists of the rules or principles that govern how the mind puts the elemental concepts that words express together to assemble the complex concepts expressed by phrases and sentences. Phrases include "drink cold water," and endless others; sentences include "Jane will only drink cold water" and endless others. Humans – or better, human minds – routinely put together complexes such as these.[5] The RRs hold that the mind's concepts and the ways of putting them together in language and thought are largely innately configured; they also hold, then, that the right way to study the mind is to construct theories of the various sorts of inner mental machinery that put concepts in place or 'activates' them, configures them in forms that the machinery allows or requires, and does the same for the rules or principles that govern how to put concepts together in the complex forms expressed by sentences. The RR theorist is a *nativist* (someone who maintains that both concepts and the ways to put them together to make complexes such as those expressed by sentences are somehow innate, implicit in the mind). And because the RR researcher is a nativist and tries to say what concepts and combinatory mechanisms are and how they develop in a child's automatic process of

maturation by constructing theories of the innate mechanisms and their operations without trying to include any objects outside the head in the subject matters of their theories, RR theorists also adopt an *internalist* research strategy.

RRs (see in this regard especially *CL*'s discussions of von Humboldt and Herbert of Cherbury) point to what they see as a strong connection between nativism and the phenomena of everyday linguistic creativity. 'Ordinary' linguistic creativity along with its important consequences – the capacity to engage in fantasy, speculation, play, planning, thought unconnected to current circumstance, plus the capacity to construct 'theories' of the world, such as speculating who is going to win the next election or the next game of football – is readily available to everyone at an early age, RRs hold, only because hundreds of thousands of richly endowed linguistically expressed concepts and the means of putting them together are innate and thus readily available at an early age. Because they are, children's minds readily provide innovative sentences, which the child can use in multiple ways. Anyone can observe mental creativity in young children – it is found in using often-novel sentences in understanding and doing in various ways. It is exhibited not just in speech, but in turning cardboard boxes into houses, in a child's fantasies, in wondering about how something works, in children's estimates of what their parents and other children intend, in their experimentation with various tools and toys, and so on. The issue is how young children can manage to be so creative at a young age – certainly by the time they are four or so, often before then. Since one must assume that with a child as with anyone else, the conceptual tools one needs to classify and think, and the combinatory mechanisms that allow one to put concepts together in various kinds of arrangements must be in place before they can be assembled in complexes, the only way to explain the early appearance of creativity is to assume innateness of both concepts and combinatory principles. And it is only because these concepts and principles of assembly and the ways to activate them with minimal experience are built into children's mind – presumably lodged in their genome and the ways it develops or grows – that we can quickly understand their creative efforts, and they ours. Innateness provides a basis for understanding one another, even at a young age. For innate concepts can be thought of as the meanings of words (lexical items, in technical terms); they constitute words' 'internal content' (or perhaps 'intrinsic content').

As suggested in Part I, RRs also emphasize a connection between creativity and their decision to adopt internalism as a research policy for the scientific study of the mind. Consider what happens if one decides to construct a theory (a science now, not a guess about the outcome of a football match) of an interesting and important aspect of the use of language and concepts – using language to refer to things. At the very least, attempting this requires focusing not just on words and how they are assembled into phrases and sentences in a system in the head, but on relationships between these internal entities and things and classes

of things in the outside world. Doing this expands the subject matter of one's theory to include not just mental objects – concepts and such – but things and classes of things in the world, and perhaps their properties too. It also demands that the relations between what is inside the head and what outside be 'natural' and determinate, fixed perhaps by something like biological growth. That is a daunting and – if the creativity observations are taken into account – very likely impossible task. One will find no determinate head-world relations of the sort required to 'fix' the uses of sentences.[6]

Yet many contemporary philosophers – Putnam, Kripke, Burge, Fodor, etc. – believe that in order to make sense of how language is meaningful at all, and for its words to have meaning, one must assume a determinate connection between some nouns, at least, and things in the world – a single thing for a proper name, or a class of things for a general term. The relationship must be determinate, or involve very few specifiable options. Otherwise tools of theory-construction fail. Proceeding on this assumption, the supposed determinate relationship is often called "reference," although "denotation" and "signification" are also used. It is often claimed that nouns, or at least some of them, refer "rigidly," to use Kripke's colorful terminology. Ordinary linguistic creativity poses a serious problem for an attempt to construct a theory of meaning that requires determinate head-world relationships. If you hold that meaning depends on reference and you want a theory of meaning for a language, you better hope that for each noun, there is a determinate referent. Or if, like Gottlob Frege (1892), you think that a referential relationship to things is more complicated, that a word is first linked to a sense (for him, an abstract object), and a sense in turn fixes a reference, you better hope that for every noun there is a single sense, and for each such sense, a single referent. Otherwise, your theory will have to allow for all of the complex and highly variable factors that figure in a person's use of language for various purposes, and in the efforts people make to understand what another person's linguistic actions mean – what they intend by them, including what they intend/mean to refer to, if anything. You will have to take into account changes in speaker intentions, in the kind of job a word is being asked to do (tell someone how to get to Chicago, criticize a work of art…), in the circumstances of speech, in irony as opposed to flat-footed description, in fiction as opposed to fact, and so on. To specify what the context of discussion is, you will have to say what count as the "subjects which form the immediate focus of interest" (to quote the philosopher Peter Strawson);[7] and there is little hope that anyone can say what these are in a way that allows for any kind of population-wide uniformity, unless possibly – the limit case, and hardly relevant for the conception of language, meaning, and reference the philosophers under consideration have in mind – the population consists of the speaker alone, at a time, trying to accomplish a single, well-understood task. More generally, there is no guarantee that anything, even when dealing with flat-footed

description and small populations, can be fixed determinately. To fix is to fix language use. Unfortunately for your project of constructing a theory based on hopes like these, as Descartes long ago and Chomsky in *CL* and elsewhere (*New Horizons in the Study of Language and Mind* – Chomsky 2000 – among others) point out, people just do not care about what your theoretical efforts demand – they do not want, and do not produce, fixed uses, even of nouns.[8] And yet to a degree that seems to be adequate for solving everyday practical problems, at least, people still manage to understand theory-resisting free uses of expressions. Resisting the needs of those who would like to have regularity and even determination, people seem to benefit from their capacity to be creative. They enjoy using words in all sorts of ways, all the while being adequately (for the task(s) at hand) understandable and speaking appropriately. Apparently, using a word – noun or other word – in the same way all the time is as tedious as putting a widget in a slot on an assembly line over and over. In sum, in no case does anything *determine* how they or you must use a word or understand it when used by another, for whatever purpose, on whichever occasion. The use of language is a form of human action, and it is on the face of it a particularly innovative and uncaused, yet coherent and appropriate free form of it.

Nevertheless, someone drawn to the kinds of cases Kripke and others focus on to provide a motivation for taking proper names as "rigid designators" seriously might suggest that nothing else explains how people with widely differing views of, say, Dick Cheney can still use "Cheney" and expect others to know who they intend. Given different understandings of Cheney, one cannot rely on what those others happen to know or assume about Cheney. So – it is argued – there must be *some* referential relationship that does not rely at all on people's knowledge or understanding of Cheney, or any other object or event to which one wants to refer. But this attempt at convincing an RR theorist is bogus. Nothing outside of context of speech or author-controlled context of writing[9] *antecedently fixes* a reference – antecedently, that is, to someone's using a term to refer, and someone else interpreting what the speaker says, using whatever resources s/he has. Of course, the process of determining what another person "has in mind" can fail, although our resources often prove sufficiently reliable that it does not matter for the purposes of discourse. These resources include shared biologies, as well as environments, communities, interests, choices in lexical pairings of sounds and the semantic features of the hearer's lexicon, and the like. These usually suffice. They must: words do not refer, people do – and those who would understand the speaker must, as best they can, put themselves into the position of the speaker by using whatever resources they have to figure out what the speaker has in mind.

Two difficulties confront those who want to claim that there 'is' a referential relationship between natural language terms and things 'out there'. One is that in few cases – perhaps none – is there reason to think that the world 'out there'

actually contains any 'things' of the sort the fixed referentialists have in mind. London is a set of buildings on a territory, but it (the same 'thing') could be moved upstream to avoid inundation; Chomsky wrote *Failed States*, which weighs half a kilo and it (the half kilo of wood pulp) is compelling (because it contains an argument); my personal library has *Failed States* and my university library has it too; Theseus built a ship and replaced all of its planks which were then reassembled in the same positions, but Theseus's ship is the rebuilt model, not the reassembled one. The ways we understand things are fixed by our conceptual resources, and our conceptual resources clearly allow for things to be abstract and concrete at the same time; they contain wood pulp and information; they are one yet many; they let ownership and responsibility trump material constitution. These are only a few innumerable illustrations that indicate that we 'make' the things of our world to suit our conceptual resources, and that typically these 'things' are identified in terms of our interests, not some kind of objective standards. We routinely name persons, but what 'are' persons such as Dick Cheney? PERSON is what Locke called a "forensic" concept, one that suits our need to assign responsibility for actions and that maintains psychic continuity. The point is general, the things and classes of things that make up the world as we typically understand it are not the well-defined entities of the sciences. What, however, of a referentialist favorite, WATER? Surely water is H_2O? Chomsky (2000, 1995a) offers many examples that indicate that we natural language users have nothing like the scientist's H_2O in mind when we speak and think of water. We find no difficulty in saying that water becomes tea when heated and a tea bag is placed in it. Our water washes us and our possessions; it may or may not be clear; it is what is in a river, no matter what it may contain in addition, even if pollutants constitute the majority; water can be calm or disturbed; and so on. Most of the universe's water is in a glassy state (in asteroids, and the like), yet if a glass is made of this material, it is not offered for chewing when one asks for a glass of water. These and other examples constitute the background for Chomsky's otherwise enigmatic remark that "Water is H_2O" is not a sentence of English. It is not because H_2O belongs to molecular chemistry, WATER is what our natural language English "water" expresses. If still not convinced, Chomsky points to a parallel in phonology. The syllable /ba/ is in the head. It is not 'out there'. The point is general: linguistic sounds are 'in the head'. They do not issue from people's mouths. All that issues from people's mouths when they speak is a series of compressions and decompressions in the air, not /ba/ or /ta/. Just as there is no /ba/ or /ta/ 'out there', so there is no London.[10]

A second difficulty is that natural languages do not seem to have anything like what philosophers and some others call "*proper* names" – nouns that 'directly' refer to a single entity – or rigidly referring general terms such as "water." Languages (the languages individuals have in their heads) do have

names, of course; that is a syntactic category of expression, one which may or may not be a primitive of a theory of a language. And names tend to have at least some meaning: most people when hearing words such as *Moses* and *Winchell* will by default assign them something like the conceptual feature PERSON NAME. Their specific lexicons might assign specific names more than this. But whether minimally or more heavily specified, names do have meanings, or 'express concepts', understanding by that they have at least some semantic features – and they have meanings distinct from the proper nouns and rigidly referring terms postulated in philosophical discussion. Since they do, it is hard to understand why anyone would think that a theory of meaning for a natural language requires going outside the head.

Perhaps, however, there is an explanation for this: an analogy to science and the practices of scientists, one that has often misled studies of natural language. Notice that familiarity with a person and his or her circumstances, reliance upon folk theories and other default strategies, and the like, play no role in understanding technical presentations in mathematics and the natural sciences. Nevertheless, reference for the group of participants (mathematicians and scientists) is virtually determinate, and the terms they use really do seem to 'refer by themselves'. This is not, however, because the symbols of technical work really *do* refer 'by themselves', but rather because all of the participants can be assumed – as Frege put it – to "grasp the same sense," and the sense is taken by all to characterize an entity or class of entities drawn from the subject matter of their joint project, whether it be mathematics, elementary particle physics, or formal linguistics. There is room for disagreement over whether a difficult proof succeeds, or a hypothesis is correct, but in doing technical work in a scientific or mathematical domain, it can be assumed everyone knows what a speaker is talking about, what s/he refers to. One physicist's chiral anomaly is the same as another's, one mathematician's aleph-null another's because they strive to be speaking of 'the same thing', whatever that might be. This is because, as Chomsky suggests, in the domains of mathematics and the natural sciences, one finds strong 'normative' constraints on same-use, constraints *not* found in the use of natural language, where people employ and enjoy linguistic creativity. Everyday speakers are not engaged on a unified project. And as Chomsky also points out, it is no surprise that Fregean semantic theories – those that suppose a community with shared thoughts and shared uniform symbols for expressing these thoughts, and an assumed constraint to be talking about the same thing whenever they use a specific symbol – work quite well with mathematics and the natural sciences (1996, ch. 2). But they do not work with natural languages, a hard lesson for the many philosophers and semanticians who try to adapt Fregean semantics to natural languages.

Strong normative constraints on use – the "conventions" of David Lewis (supposedly needed in order to allow for communication and cooperation at all)

and the supposedly determinate "practices" of Sellars and company – do not exist.[11] They are just not needed in everyday speech. We have many resources available to deal with interpretation, and speaker and hearer find attempts to constrain fettering. That does not mean that one cannot have a theory of meaning for a natural language. But it must be internalist.

In sum, there is no reference apart from someone who refers; relations to the outside world (and even in a sense 'the world outside' as understood by the concepts expressed in natural languages), are established by and through actual uses. That is true in the sciences and everyday discourse, although in the sciences and math – as indicated – practices are 'normalized' and come close enough to the Fregean picture of semantic theory to allow one to idealize and ignore the contributions of a person. All this puts internalists such as Chomsky in what is these days an unusual position. He rejects the very popular (among linguists and some philosophers) Fregean model of semantics ('theory of meaning'), and along with it what Jerry Fodor calls a "representational theory of mind." If you hold that natural language reference (that which involves use of the terms of natural languages such as "London" by people in variable circumstances engaged on different projects and having variable interests) is not an apt subject matter for science, you must also hold that representation of things in the outside world by use of natural language terms is not either. Indeed, you must reject – or perhaps reinterpret – a considerable chunk of contemporary "cognitive science," at the very least, that chunk that purports to offer a semantics for natural languages that assumes a relation between natural language entities and the world. Perhaps, as Fodor (1998) put it, a representational (essentially Fregean) theory of such concepts is the "only game in town." Yet Chomsky and other contemporary RR theorists (there are a few) seem to have no qualms about doing cognitive science and dealing with fully internally determined concepts/meanings. I suspect that is because they know that there is a non-re-presentational naturalistic science of language and of what it provides the mind (likely in the form of "semantic features") in place, and they think that this suffices for a theory of natural language meaning and meaning-composition. If so, they can look at the loss of determinate mind–world relationships such as reference and denotation with equanimity.[12] Indeed, they might be quite willing to maintain that no science of vision, nor other theory of the mind, need be committed to a Fodorian representational view.[13] Do the "blobs" of David Marr's *Vision* denote anything out there? Surely not. His 3-D 'representations' do not, either. The points made above about the syllables /ba/ and /ta/ in phonology (an internalist science) are worth considering again in this connection. There is an interesting way in which Chomsky agrees with the philosopher Wittgenstein (whose later works, along with J. L. Austin's, he was reading when he wrote his massive *Logical Structure of Linguistic Theory* – a work that takes language as a (natural) tool that can be used in various ways). Wittgenstein

(1953) thought that words and sentences are 'tools' that we use to carry out various everyday tasks, and he held that their meanings are the jobs they perform. Since they are, he thought, if you want to know what expression E means for person P, find out how s/he uses it – what function it serves in performing whatever task s/he is carrying out. Then he reasoned that since people use words and sentences in all sorts of ways, the best one can do is *describe* how another uses a word on an occasion. You cannot, he said, construct a *theory* of meaning if you think that the meanings of words are found in the ways they are used. In this respect he and Chomsky agree: there just is not enough uniformity in the ways people use expressions to support theory. So if you think of meanings in terms of their uses, you get no science. So far, Chomsky and he agree. But for Chomsky, that just shows that you are looking in the wrong place for a theory of meaning; look at what biology provides you in the head. Wittgenstein's warning was generally ignored; philosophers such as Lewis and Sellars and innumerable others simply assumed (perhaps with the practices of math and science in mind) that there must be a great deal more uniformity of use than appears, and postulated conventions and uniform practices that just do not exist. As we have seen with reference, that is not a good strategy. Internalists such as Chomsky suggest looking at the matter from the other direction; do not think of meaning in terms of use, but think instead of internally sourced and theoretically specifiable features of words and sentences. These still provide 'tools'. Having the natures they do allows them to be used in the ways that they obviously are. In other words, explain not how people use words, but how their creative use of words is possible. It is possible, the RR theorist holds, only because with language, internal systems provide configured and rich 'perspectives' for the use of people. These perspectives have the shapes and characters they do because of the contributions of syntax (which puts words together) and the semantic features of the words that compose them, where these semantic features are taken from internal resources. And these shapes and characters help shape and 'give meaning to' experience and thought.

Focusing now more closely on RR strategy for investigating language, proceed by assuming that the language faculty is a modular internal system that operates in a determinate way, where that way is fixed as a result of principles of organic growth; the system is, then, innate and because it operates when mature in determinate ways and develops in accordance within fixed constraints on growth, it is possible to construct a theory of it. That theory aims to describe and explain the internal operations of the faculty, assuming these to be procedures for taking the various kinds of 'information' available in lexical items stored in a person's mental dictionary and, by a procedure that joins lexical items and the information that they contain to one another, yields a sentential expression. A sentential expression consists of a sound and a meaning; it can be thought of as a paired form of information: sound information and

meaning information. Each kind of information appears in forms that can be 'read' ('understood') by the relevant kinds of other internal systems at two interfaces, the sound interface (PHON(etic interface)) and the meaning interface (SEM(antic interface)). The sound information is used by perceptual and articulatory systems to yield compressions varying in frequency and amplitude in air (or – as with thought – it stays 'inside') or to 'decode' these signals received at the ear; the meaning information is used by "conceptual and intentional" systems to do – after the contributions of these others systems – with this information what a person wants, perhaps to ask someone a question or to try to figure out why her watch doesn't work. An internalist theory of *linguistic* meaning focuses not on how the semantic information in lexical items is 'read' by other systems in the head, but rather on (1) describing in theoretical terms the relevant kinds of information available in lexical items and (2) saying how it got there (answering Plato's Problem – the acquisition problem – for lexical sounds and meanings). For children acquire 'words' very quickly indeed, offering in doing so large numbers of poverty-of-the-stimulus observations. Given the rate at which they are acquired – about one a waking hour between age two and eight – the specific characters of lexical 'sound' information, and the intricacy of lexical meanings (intricate beyond anything described in the most detailed dictionary), we must assume some kind of internal mechanisms. Perhaps the most challenging one is the mechanism that assembles lexical 'meanings' – i.e., relevant kinds of semantic information. When that mechanism is specified, it will constitute an important part of an answer to Plato's Problem for lexical acquisition. Then, (3) we must say how the semantic information in lexical items is composed by syntactic principles (syntax yields a theory of compositionality), and (4) indicate what is provided at the semantic interface to other systems, including modifications, if any, due to composition. All of this must be done, furthermore, while meeting standard conditions on naturalistic scientific research, outlined below. Accomplishing all of these tasks is very difficult, but there has been some progress. At least it is clearer now than it was fifty years ago how syntax contributes, and how to construe the overall contributions of language at the relevant interfaces to the rest of the mind. There has also been at least some progress made in investigating semantic features. But a lot remains to be done. Nothing looks to be impossible, though, as does a naturalistic theory of reference or a socially determinate account of use.

Informally, one can think of the semantic information provided in a lexical item as a lexical concept, and of the semantic information combined at the semantic interface as a sentential concept. This captures the idea that concepts are the internal tools we humans use to – as above – ask someone a question or speculate about why one's watch does not work (and what to do about it). Internal conceptual tools are what we use to categorize, to think, to speculate, and so on. An internalist linguistic theory of meaning details the

contributions of the language faculty to a person's conceptual tools. That contribution, it seems, is substantial. And there is little doubt that syntax allows us to be as flexible in our cognitive exercises as we seem to be. A great deal more could be said, but this will suffice for this introduction. An internalist theory of linguistic meaning can go a long way towards making sense of why we think of our words and sentences as "meaningful." They are meaningful because they offer us the tools to do what we do.

But if semantic relationships to the outside world do not figure in internalist theories of language and their meanings, surely the outside world – its things and events, its social institutions and the practices of people – must figure in the RR picture of the mind and its study in *some* way? The world outside the head does figure, but in ways that do not challenge the RR assumptions and the internalist research strategy they base on them. First, as mentioned before, the audible and visible 'externalized' ways people use concepts to think and act – to categorize, describe, assess, complain, convince, etc. – provide some evidence for and against theories of the internal mechanisms. But, they point out, a theory does not consist of its evidence. Operationalism and instrumentalism, epistemological versions of behaviorism, and so on, are not theories; they are empiricist-motivated (and very poor) methodological recommendations. A mental theory is a theory of an internal system – its algorithms or rules of operation, its inputs and outputs, and the means by which it comes to have these rules, etc.

Second, the outside world is no doubt the source of some of the input or data – the 'experience' – needed for the language system/organ to begin to develop, and continue development to reach a steady state (vocabulary additions and subtractions aside). Just as vision does not develop normally if it is not given the 'right' kinds of input during critical stages of development, so concepts and their combinatory mechanisms do not develop in the child unless they receive at least some external input of the 'right' kind. In the case of language, the child does not develop language normally unless his or her mind is provided with at least some linguistic input that has the form of one natural language or another. The input required is, however, remarkably small – not in absolute scale, but relative to the specificity of what is acquired – and the input may be corrupt. Development is robust; it seems to be "channeled." And, it is important to recognize, with neither concepts nor combinatory principles does the shape or character of what is activated result from the input. Perhaps the need for a concept arises as a result of prompting or stimulation from the outside world, but the shape and character of a concept or combinatory system is determined by the mind itself, not the world or community. Indeed, the mind's developmental operations 'say' what kinds of data are needed. Generally, internal developmental mechanisms – not the external world or a person's community – specify the kinds of causes or external prompts/patterns required for activation and maturation.[14]

Given such beliefs about the mind and its study, the RR advocate is likely to maintain – as suggested above – that the view of the world that one gets through the lens of our innate concepts and combinatory principles owes more to the characters of our concepts and combinatory principles than it does to how the world might be 'in itself'. To put a label on this kind of view, I will call it (a form of) constructivism: our minds 'make' the world, rather than the other way around. I mention it here to underscore the difference between the RR camp and the empiricist one. For empiricists believe that in the case of most concepts (perhaps not 'pure' sensory ones) and combinatory principles, the world shapes the mind.

The RRs' opponents, the empiricists, hold that most of the concepts expressed in natural languages (DOG, HOUSE, WASH…) and the combinatory principles that place them in understandable sentences are not innate, but rather learned. Perhaps they are assemblies of perceptual 'features' (Locke, Prinz (2002)), specific kinds of roles constituted by the 'moves' (inferences) people engage in when exercising social practices, 'connection weights' in neural nets, and so on. However construed, concepts and "rules" are learned by engaging some kind of generalized learning procedure (hypothesis formation and testing, association, training procedures, behaviorist conditioning…) that after repetition and 'feedback' in the form of positive and negative 'evidence' comes to converge on what society, the experimenter, 'the world', or some other assumed judge of meeting a criterion accepts. However construed, the empiricist believes that the environment, including society, makes and shapes concepts and the principles ("rules") of their combination through some sort of generalized learning procedure, a procedure that usually involves not just (a lot of) sensory or other low-level input and/or data, but a trial-and-error procedure of some sort, where error is corrected by some kind of 'negative evidence' ["that's not right;" pain/punishment on a behaviorist version of empiricism], perhaps provided by parents or instructors, perhaps even (it is claimed) by the lack of data. Because the empiricist holds that such procedures are sufficient to learn the thousands of concepts that four-year-olds have available, *and* to learn the combinatory principles and structural constraints of a local language, the empiricists must assume that much of the child's early life and use of language is devoted to focused data-gathering and training sessions that consist in getting the child to conform to the "speech habits," 'proper' (epistemically appropriate, etc.) applications, or uses of concepts the child's trainers want it to exhibit. For otherwise one would find – contrary to fact – children acquiring language and many thousands of concepts at very different times (depending on training, the resources of trainers, native intelligence, interest and devotion to duty…), going through very different stages of development, and so on. However the story is told, empiricists are *anti nativist* and *externalist*: they maintain that concepts such as those mentioned above and the combinatory principles or

"rules" that languages offer to produce complexes of concepts (what sentences express) are 'learned' by experience of things and events 'outside'. Because of this, they must hold that study of the contents of the mind cannot be divorced from the environment(s) in which the mind is situated, where an environment includes for language crucially the linguistic behaviors (presumably respecting the linguistic practices) of a "community." In at least this sense, the empiricist is committed to an externalist program.

There is a massive amount of question-begging here. What, exactly, is a generalized learning procedure? How are hypotheses concerning the applications of concepts formed if one does not have the concepts in the first place? What counts as similar, what dissimilar? How, specifically, does analogy work in trying to extend acquired knowledge to unacquired? Where does linguistic structure come from? What counts as sufficient to show that child N has acquired any or all concepts $\{c_1 \ldots c_n\}$, or rules $\{R_1 \ldots R_n\}$? Where are all the trainers the learning procedure requires, and even assuming that there are some, where do they find the time? Why do children at a particular stage of development completely ignore – virtually not hear – their parents' admonitions to say "went," not "goed?" What about the fact that our concepts have little to do with what is really out there? Why does only the human mind seem to acquire language in the normal way? Why do intelligent apes fail to acquire a language like any human sign language, no matter how much they are trained? Where do the hierarchies found in natural language clausal constructions come from? Why do languages appear only in certain forms? How does a child manage to develop the notion of a phoneme? And so on, and on. Chomsky has noted many of these gaps, and others, in empiricist views since at least 1957 with *Syntactic Structures* (and before that, *Logical Structure of Linguistic Theory*, although it was not published until later) and 1959 with his review of Skinner's *Verbal Behavior*. Some of his criticisms reappear in *CL* in what he has to say about "modern linguistics." A few are highlighted below.

There is another problem, related but less noted. On the face of it, the empiricist has a difficult time accounting for early creativity. Given the enormous amount the child must be assumed to have acquired in order to display what is in fact observed to be in their repertoires (thousands of concepts, sounds, and the combinatory principles of a language) in order to gain the kind of "mastery" of concepts and the ways that they can be combined needed for everyday linguistic creativity, and given the enormous amount of time surely needed to get what a community insists is "the right way to speak" (and classify, describe, explain, speculate…) out of a "generalized learning mechanism," it is hard to explain what seems to be effortless creative use of language on the parts of *all* normal three-and-a-half or four-year-old children. And it becomes extremely difficult to understand how all children manage to be creative in the 'ordinary' way at about the same time; surely intensity of training,

differences in native intelligence, parental resources, and different varieties of experiences would all lead to different rates at which a child learns to "master" what is needed. Ordinary creativity seems to pose a serious challenge to the empiricist camp's assumptions about the nature of mind and their research strategy.

As my remarks so far emphasize, the choice between RR and empiricist assumptions about the mind and scientific research strategies turn on a rather simple set of observations that anyone can make concerning linguistic creativity (particularly with children), and another set concerning rate and timing of learning/activation, and the kind(s) and amount of input received. RR approaches to mind and language seem to respect these simple observations, and take their task to be explaining them or – where scientific explanation is impossible, as with creativity – to seek to show how what is in the mind makes the phenomenon possible. To the extent that empiricist approaches do not take these observations and the tasks they set for the science of mind seriously, they seem to be ignoring facts that stare them in the face. Empiricist strategy for the study of mind does not seem to be responsible to empirical facts.

II.2 The Chomsky difference: naturalizing language and mind

While his basic assumptions about the mind and the strategy to use to study it are much the same as those of his RR predecessors, and while his predecessors – many of them the scientists of their days – would very likely have welcomed his efforts and their result, Chomsky, unlike the others, has tried throughout his career to turn the scientific study of language in the mind (and of mind in general) into a natural science, ultimately a branch of biology and other natural sciences. (After his earliest efforts, of course, he had the help of many others working within his assumptions about how to proceed.) This project is implicit in RR assumptions about the mind. If much of the mental machinery needed to develop concepts and their combinatory principles is innate and one is going to try to explain how it comes to be in the mind at birth, it won't do to say that God put it there (Descartes) or to construct myths of reincarnation (Plato). The only course open to us is to look to biology and those other natural sciences that can say what an infant human begins with at birth and how what s/he is born with develops. And taking that tack also makes it possible to at least begin to speak to the question of how human beings came to have apparently unique machinery in the first place – to address the issue of evolution.

Placing the study of concepts and their combinatory principles in natural science also imposes specific and well-known methodological constraints on the task of the scientist of the mind. Adopting nativism amounts to beginning a research effort that assumes that concepts and language are somehow implicit is some kind of natural 'mechanism' of the human body-mind, under (partial)

control of the genome and the course of development it controls. Constructing a theory of concepts and language is, then, constructing a theory of the relevant mechanisms, and of how they develop. Trying to do that places one's efforts firmly within the natural sciences, and demands that one meet the criteria of successful science that other natural sciences aim to meet. Of course, one's theories are theories of an internal system and how it develops; but 'going inside' makes no difference. One's theory must meet the standards of success that any natural science must meet, regardless of subject matter: the linguist or lexical concept-theorist must construct theories that satisfy the same demands that the theories of the physicist aim to meet. Would-be internalist mental scientists must produce theories that are *descriptively adequate* in that they fully and accurately describe all the elements and properties of the 'things' the theory deals with – in the case of language, words, sentences, and how words come to be put together to make sentences. Further, a theory must be *explana torily adequate*; in the case of language, it must say why a child has just these elements in his or her language at a specific stage of development, and – once one has explained this – one must deal with further explanatory issues, such as how language came to be introduced in the species. Further, a theory must provide an explicit, formal specification of everything that the theory aims to describe and explain – it must be *formalized* with, if relevant, quantification according to an appropriate measurement scheme of the elements and their 'powers' or features. In a connected vein, a naturalized form of mental science must aim towards *simplicity*: the theory must offer a compact yet full account of its subject matter. With language, for example, this can amount to constructing theories with as few principles or rules of combination of words as possible, and stating these rules as economically as possible. Further, a theory must aim towards *objectivity*. As the history of science indicates, that requires abandoning the anthropocentrically oriented concepts of common sense (the ones that we are born with, including the common-sense concept LANGUAGE) and inventing concepts that can adequately describe and explain – for language – any language whatsoever, plus say how and why a particular language developed in a specific individual. And a theory must aim towards *accommodating* the mental science in question to another science – in the case of language, certainly biology – among other natural sciences. Finally, a condition that reflects everything said so far. The internalist theory must *make progress* – successive or at least temporally nearby theories of the relevant domain (theories of language, vision, facial configuration…) that show improvement in one or more of the dimensions just mentioned. Progress is measured by the standards of the methodology itself.

Chomsky's efforts at constructing sciences of language have improved in all these dimensions – that is, his theories have made considerable progress. I point to some of the signs of progress later. That there has been progress suggests that

his efforts and those of the many who, like him, adopt an RR view of the mind, are on the right track and somehow seem to cut nature – in his case, the language organ – at the right joints. The progress in turn makes it tempting to hold that the target of these theories – the language organ – is 'real'. And it makes it tempting to adopt a policy of saying that what the best theory (by the relevant standards) says about the organ is true, and that it does describe and explain 'how things are'. The temptation should not be resisted. We rely on both science and common sense to get an understanding of ourselves and of the world. Each approach has its merits. Common-sense concepts notoriously fail in science, while scientific concepts such as MU-MESON are hopeless in solving the kinds of practical problems that common sense deals with. Each kind of capacity to solve problems has its place, and neither deals with all problems. Where the aim is objectivity and the precision of explicit and formal statement, however, there is no choice: the methods of the natural sciences yield the only answers we are likely to be able to get. And if at a time a theory is the best available, it tells us what language – or vision, etc. – is.

Certainly Chomsky's efforts have progressed well beyond those of his RR predecessors. Where his predecessors countenanced unexplained powers and had to be satisfied with pointing in a direction, or where they had little idea of how to make sense of innateness, Chomsky cannot and does not. For example, Descartes and the Port-Royal grammarians in the sixteenth and seventeenth centuries in the final analysis attributed the articulation and productivity of language not to an organic internal system, but to an unexplained power called "reason" or "thought." But thought, for example, is best understood as constituted, in part, by language: we use language to think. So we should try to say what language is without appealing to thought. Chomsky clearly distinguishes language and its study from the ways in which language can be used, including thought and reasoning. To do that, he constructs a theory of a biophysically based organic system. And to make sense of innateness, his predecessors might have pointed to divinity (it's a gift from God) or they might hold that it has something to do with Nature, but say little about how God managed to get concepts and combinatory principles into our heads. His RR predecessors did, though, make at least some progress. In contrast, empiricists seem to have added little to Locke. And, like Locke's efforts, theirs generally fail to meet the conditions on adequacy of a *naturalistic* theory.

Many empiricists would not be bothered to be told that their efforts are far removed from naturalistic theory-construction. That is because many current empiricists, at least, think of language as a complex form of social practice learned from others, with practices varying from language to language and environment to environment, and of concepts learned as a part of acquiring linguistic and other practices. They might, as Wittgenstein did, think of concepts as epistemically governed 'roles' in linguistic practices or 'language

games'. For them, languages are social institutions and artifacts, not states of a biologically based mental 'organ'.[15] Still, they want to call themselves scientists. To make this seem credible, they might argue that they are offering a far simpler 'hypothesis' than Chomsky's (once) rather daunting-looking theories of Universal Grammar (UG). Their hypothesis is that language and concepts are learned by some kind of generalized learning procedure. They take their generalized learning procedure to be the simplest hypothesis concerning concepts and combinatory principles because it is the least committed to the existence of any kind of domain-specific mental machinery – anything devoted to language, for example, for that would make language innate. So if they want to speak to what is in the head at all, they stipulate that what is in the head must be some kind of neural net that has the property that it can be modified by 'experience' and correction of its outputs. Perhaps there are innate organic mental modules for vision, audition, and the like. And no doubt these have some quite remarkable innate properties. But there must be a lot of the mind/brain that is plastic and can be modified by experience and training procedures, for that is where language must go. To show the merits of their 'hypothesis' (which is rarely, if ever, explicitly stated), they might introduce computer models in the form of 'neural nets' of what they believe are the plastic regions of the mind/brain and subject these computer models to input that is supposed to simulate their views of human linguistic experience and the data of language learning. They consider their efforts successful if the computer model 'learns' to perform the 'task' set it to the satisfaction of the 'experimenter'.

This story makes language acquisition a miracle: standard naturalistic explanations routinely employed elsewhere are simply rejected, and for human language alone. The empiricist is happy enough to say that a child's pet songbird acquires the song it does for naturalistic reasons; input may be required for development to proceed, but development, and the song patterns that develop, are largely under genetic control. But human language? It *must* be explained some other way. Refusing to see languages and concepts as natural objects for which one needs naturalistic theories is a form of what Chomsky calls "methodological dualism": when it comes to crucial features of the mind, the empiricists abandon not just internalism and nativism, but the methods of the natural sciences. They lodge languages outside the head and might (e.g. Prinz 2002) treat the everyday concepts we have, such as CURRY, as built out of primitive mental items like sensory features, but built under exogenous control, not the control of internal developmental machinery that demands many non-sensory features (such as ABSTRACT). Or they might (Sellars and many others) speak instead of the 'token' "curry" in terms of learned games and social practices, construing its meaning in terms of its contributions to socially sanctioned truth or correctness conditions for the 'token' "curry." However glossed, the character and certainly the (supposed)

referential powers of the concept CURRY depend on how a community of speakers use the word *curry* – the contexts, what get counted as the right or correct or true or appropriate uses, and so on. The only internal and presumably 'natural' machinery relied upon are some sensory capacities and some form of generalized learning procedure, cashed out perhaps in a version of associationism and/or behaviorism embedded in a plastic neural net. The procedure might consist in some kind of statistical sampling procedure lodged in what starts out as an undifferentiated neural net, a modern empiricist's version of Locke's blank slate.

Not all empiricists are methodological dualists. But that is not because they think that languages and concepts are somehow natural objects. Some, such as Herder and Foucault (who count as empiricists by virtue of being anti-nativist and externalist[16]) were unable to understand what a naturalistic scientific methodology is, or appreciate the very different objective view of the world it yields when compared to the anthropocentric view got from common sense.[17] Only those empiricists with an appreciation of the differences between science and common sense ("folk physics," "folk psychology," and the like) are apt to adopt methodological dualism. The twentieth-century American philosopher Sellars and his intellectual progeny (e.g. Churchland, Brandom), and the philosophers Quine and Putnam and theirs, might have anything from a reasonably clear to a very good (e.g. Putnam) idea of what naturalistic scientific methodology is,[18] but they clearly refuse to hold that language and concepts could be investigated using this methodology, rather than some version of an empiricist one. At this stage in the development of the science of mind, their refusal is to the RR strategist puzzling, at best. With concepts, perhaps there is some room for sympathy with the empiricist strategist. While there is no doubt that the poverty and creativity observations make a RR strategy reasonable, naturalistic theories of concepts are still in their infancy. Among other things, even those sympathetic to the strategy, such as Fodor (1982, 1998), are drawn to views (such as that concepts by themselves denote) that – as noted before – make a straightforward internalist and nativist approach impossible. But, RR strategists such as Chomsky must feel, surely it is unreasonable to adopt a non-naturalistic methodology for the study of language. Here we find articulated theories, and very considerable progress on all fronts. Quine's view that in the study of language, "behaviorism is mandatory" appears to be nothing but dogmatic refusal to face the obvious facts.

But is not what empiricists propose naturalistic inquiry after all, especially in the form that some of the connectionists have devised, where we find ingenious efforts to get "simple recurrent networks"[19] and the like to (say) "recognize" classes of things, or after massive training produce outputs that seem to indicate that the network's connection weights have somehow embodied a 'rule' – that is, yielded a pairing of inputs to outputs that suit the experimenter's criteria for

correct behavior? For Chomsky the answer is flatly "No."[20] However ingenious the techniques used, and no matter how much technology is thrown at prosecuting them, empiricism is wedded to a picture of the mind and of how it gains and uses language and 'content' that does not and, unless modified so that it becomes largely indistinguishable from a rationalist approach, cannot address readily observable facts about human language acquisition and use. Even the few celebrated 'successes' turn out to be failures when what the connectionist offers is required to speak to questions that must be taken seriously and addressed. Quoting from one of Chomsky's comments on the manuscript for this introduction:

> … No matter how much computer power and statistics … [connectionists] throw at the task [of language acquisition], it always comes out … wrong. Take Elman's famous paper the most quoted in [cognitive science,] I've been told on learning nested dependencies. Two problems: (1) the method works just as well on crossing depend encies, so doesn't bear on why language near universally has nested but not crossing dependencies. (2) His program works up to depth two, but fails totally on depth three. So it's about as interesting as a theory of arithmetical knowledge that handles the ability to add 2+2 but has to be completely revised for 2+3 (and so on indefinitely). Such approaches could do far better trying to duplicate bee communication or for that matter what's happening outside the window (where they would do vastly better than phys icists). Why don't they do it? Because it would be ludicrous: no scientist is interested in some way of matching data. [Clearly, insisting on this with language is] … just more methodological dualism.

It is an irrational insistence on taking human language and concepts outside of the domain of naturalistic research.

Perhaps there is reason to take empiricism seriously with some aspects of the study of cognition – perhaps with analogical reasoning, perhaps even with some aspects of the acquisition/learning of scientific theories and their concepts. But with common-sense concepts, and especially language, there is no reason to take empiricist speculations at all seriously. No one finds children subjected to the training procedures for concepts or language explored by connectionists, for example. That is only one of many reasons why Chomsky believes – not unreasonably, given the facts and the progress made with language – that dogma, not reason, drives empiricist research strategy. The apparent aim is not to explain the facts of human language and concepts and their growth, but to show that what are claimed to be plausible models of neural networks can be made to simulate (to an extent) some human cognitive behavior or another, to the satisfaction of the experimenter's view of the job that the behavior is supposed to do. There might be some minor success in *that* effort: acquisition of irregular verbs is claimed to be a success. But this and even weaker candidates have nothing to do with the conditions under which children acquire concepts or language, nor with what they have in their minds when they acquire

them – tools, apparently, that can do all sorts of jobs, not just display a favored kind of behavior to the satisfaction of the experimenter. Getting a 'neural net'[21] that meets empiricist conditions after massive training to display some behaviors (classifying, inferring…) in performing some task or another to some degree of satisfaction might be useful for some purposes. It might offer a clumsy and time-consuming and probably unreliable way to get some machine to 'learn' how to do something without just programming it to do what you want it to (assuming you know how to ritualize that). It might also charm those impressed by what one can accomplish with minimal tools – and lots of time and sufficient funds. But unless one can explain what anyone can readily observe in children – what the poverty and creativity observations point out – empiricist efforts like these make no contribution to sciences of the mind.

This view of Chomsky's should not, incidentally, be understood as a blanket condemnation of computer modeling of various aspects of concepts and language, and perhaps of aspects of their use. Some of that can be very useful – among other things, one finds interesting work being done on the lexicon and lexical features that is useful, perhaps even important, to an RR strategist. The objection is to insisting that the facts must be otherwise than what they are with the strategy to use in the study of language and concepts.

II.3 Naturalizing the study of language: biolinguistics

Those who construct naturalistic theories of specific subject matters generally aim to accommodate their specific science to at least one other natural science – perhaps a more general one, or a more specific one. This is just doing what any natural scientist does: accommodate physics to chemistry, for example, or accommodate major parts of biology to organic chemistry. Accommodating linguistics to biology has been one of Chomsky's aims virtually from the beginning, but certainly it was an aim by the time he wrote *CL*. The primary issue was, and is, this: what does a child have at birth that allows him or her to acquire any natural language whatsoever under the conditions described by the poverty of the stimulus observations. Clearly, the child has something; call it "Universal Grammar" (UG). To accommodate language to biology, the obvious first question is what UG has in it – what UG *must* have, if the facts are to be explained. Or to put it another way, what is essential to human languages; what must all human infants have that the young of creatures that lack language lack? To answer that question, one must say what UG is – one must construct a theory of the "initial state" of the language faculty. Further, to have any chance of reaching accommodation with biology, one had better hope that it turns out that UG is not very complex and rich – that very little is needed to explain how having that essential element is sufficient to yield not just *a* language, but *any* natural language. For if it should turn out that UG is complex and rich, it will be

very difficult to make sense of how the human genome could come to have a complex and rich 'instruction set' – the 'information' necessary, given minimal input, to yield any natural language. While accommodation was a desideratum from the start, the route to success did not become at all clear until after *CL* was written, not until the late 1970s and early 1980s. Since that time, there has been considerable progress in coming at least to understand the program (Chomsky calls it the "minimalist program") needed to reach accommodation. No one can say with any confidence that they have the answer now, and that point is probably still a long way off. But, unlike the situation in the mid-1960s, it looks answerable.

Although progress in accommodation was a long way off when *CL* was written, the "standard" grammar of the time – found in Chomsky's 1965 *Aspects of the Theory of Syntax* – made progress in reaching the other desiderata characteristic of naturalistic research. It is useful in reading *CL* to have in mind what had been accomplished at the time, and why the amount of progress made then made accommodation seem out of reach. In fact, one of the points of *CL* was to indicate how far things had come since the work of earlier RR efforts. More generally, indicating progress illustrates how fruitful for the scientific study of language it has proven to be to adopt the basic RR strategy and naturalize it. What looked earlier to be gaps in efforts to explain are filled and unanswered questions get answers. Apparently insurmountable problems become easy to deal with, unexplained structural features of languages have come to seem natural – natural necessities, even, given that language is a natural object. I will not detail any of this; to do so would require getting into the details of specific grammars and making this section far longer than it already is. Instead, I will focus on what Chomsky with *Aspects* in hand said in *CL* about what was wrong with the efforts of the Port-Royal grammarians in the seventeenth and eighteenth centuries. That might appear to be unfair; why not gauge progress over the work of linguists – including Chomsky – far closer to 1965? But, except for grammars advanced by Chomsky and his co-workers themselves – with the possible exception of von Humboldt, although he did not actually make an effort to construct a generative grammar – there are no moderately detailed RR candidate theories of language until Chomsky's early 1950s *Morphophonemics of Modern Hebrew* and the mid-1950s (and massive) *Logical Structure of Linguistic Theory*. Comparing the progress of *Aspects* over what Chomsky did in *Logical Structure* would require going into great technical detail. Granted, he could have compared *Aspects* grammar to the grammars offered by what *CL* calls "modern" linguists (guided by principles outlined by Bloomfield, Joos…), or structuralists such as De Saussure. But these are empiricist efforts, and they are patently hopeless at making sense of either poverty or creativity observations. That would not illuminate progress in RR research strategy. Progress over Port-Royal efforts does: as *CL* indicates, the

Port-Royal grammarians came up with something that invites comparison. They came up with observations and a few principles that looked surprisingly like what one finds in *Aspects*. Perhaps that is why in *CL* Chomsky explicitly compares what they accomplished with what had been accomplished in *Aspects*-type grammar.

In barest outline, the Port-Royal grammarians attempted to construct grammars for natural languages on RR assumptions about strategy. They assumed that there are universal features in the grammars of all languages and that linguistic productivity – putting words together to make endless numbers of sentences – can be described by appeal to a system of rules. And they thought of themselves as scientists ("philosophers") of language, hoping to determine the nature of a system in the mind that humans alone have. Chomsky had no trouble rephrasing and articulating at least some of their observations and principles in terms he employed himself. For numerous examples, see *CL*'s "Deep and Surface Structure." One helpful example appears early in that section in Chomsky's discussion of how their grammar (and *Aspect*'s) could take the 'deep' forms *God created the world*, *the world is visible*, and *God is invisible* (or rather, abstract representations of these) and transform them by "transformational" rules (hence, "transformational grammar") to yield the 'surface' form *Invisible God created the visible world*. The reader can look at the section for the details of this and other examples.

Summarizing Port-Royal efforts from the vantage point of *Aspects* and pointing to the limitations of what the Port-Royal grammarians managed to do, Chomsky remarks in the third paragraph from the end of *CL*'s section *Description and Explanation in Linguistics*:

> The[se] philosophical [scientific, universal] grammarians considered a wide realm of particular examples; they tried to show, for each example, what was the deep structure that underlies its surface form and expresses the relations among elements that determine its meaning. To this extent, their work is purely descriptive… Reading this work, one is constantly struck by the ad hoc character of the analysis, even where it seems factually correct. A deep structure is proposed that does convey the semantic content, but the basis for its selection (beyond mere factual correctness) is generally unformulated. *What is missing is a theory of linguistic structure that is articulated with sufficient precision and is sufficiently rich to bear the burden of justification*. (My emphasis)

The Port-Royal grammarians made some progress in (informal) description, but they could not justify. To do that is to show how one can solve Plato's Problem.

First, some points of agreement: Port-Royalists realized that anyone attempting a serious grammar for a natural language must construct a generative[22] theory of that language in order to provide for the endless linguistic resources people display when they use language creatively. The Port-Royal grammarians aimed to produce such a grammar. Another point of agreement: they, like Chomsky, aimed for a universal (scientific, objective) grammar, and believed

that only by offering such a grammar could one not just describe language, but hope to explain why it is the right grammar for a speaker's language – why it, and not another one, ended up in the child's mind. Still another: the overall 'shape' or 'format' of the Port-Royal grammars resembled in interesting ways the grammars Chomsky constructed in the mid-1960s. Chomsky at the time thought that all grammars for natural languages have the same format. Among other things, all consist of a "phrase structure grammar" which has the effect of assembling words into abstract structures that, after the operations of "obligatory transformations," resemble what might be thought of as simple sentences, such as "God created the world." These structures have a "semantic interpretation" – they are given a 'meaning'. These Deep Structures can in turn be combined in more complex structures, and/or otherwise changed; the part of the grammar that 'does' this is the optional transformational component. The output of that set of operations is a "Surface Structure." These transformed structures are in turn given a phonetic interpretation: they are assigned a 'sound'. One of the aims of the Port-Royalists was to capture the intuition that while languages can differ a great deal in their sounds, they are fundamentally the same in meanings. That theme continued in *Aspects*, obviously.

How exactly, then, does *Aspects* improve on what the Port-Royal grammarians accomplished? One great improvement was in descriptive adequacy. Chomsky's grammars are formalized, and explicitly articulate the relevant rules and principles, the 'levels' of a computation, and the relations between levels and elements. You cannot describe a language by listing sentences; you would have to provide an infinite list. The only adequate way to describe a language is to construct a formal theory (grammar) of it, one that states in explicit formal terms what the language's rules or principles are. The Port-Royal grammarians did not manage that; their efforts lacked "sufficient precision," as Chomsky notes. One must say explicitly what the phrase structure and transformational rules for a language are. If you do not, you cannot describe a language at all, nor decide whether your grammar is the correct one – that is, satisfy descriptive adequacy conditions. Of course, Chomsky had an advantage over the Port-Royalists; mathematics and other formal studies had advanced a great deal in the intervening centuries. But that does not diminish his contribution.

Another, more fundamental advance was in the primary task for those who want not only to describe, but to explain. While the Port-Royalists aimed in their attempt to produce a universal grammar to develop one that could explain as well as describe, what they offered – in part by virtue of lack of precision – could not explain why a child's mind, given data under poverty of the stimulus conditions, selects grammar X as opposed to all the thousands of other possibilities. They could not really solve Plato's Problem, or really even state it in an explicit way. Chomsky's *Aspects* could at least state what needs to be done to

solve Plato's Problem, and it actually suggested a solution that now looks inadequate, but that at the time was the only one available. Clearly, then, Chomsky's *Aspects* grammar was both descriptively and explanatorily more adequate than Port-Royal grammars.

Here in outline is the device Chomsky used in the mid-1960s to make sense of how the child's mind automatically 'selects' grammar X as opposed to Y – that is, learns X as opposed to Y, given data D. Think of X and Y as sets of rules, both candidates as descriptions of language L or, more carefully, of the data available to the child's mind. Which should the child's mind choose? Introduce now an 'internal' simplicity measure: rule set X is better than Y to the extent that X has fewer rules than Y.[23] If one can measure whether one grammar is better than another in this way, it does not stretch credulity very much to imagine that some internal and innate device in the child's mind 'chooses' X over Y by applying such a measure. That is, it is plausible to assume that something in the child's mind – not the child consciously choosing between alternatives – chooses and thereby acquires or learns X, given a choice between X and Y. Chomsky's mid-1960s efforts to solve Plato's Problem relied on this kind of postulated device. By doing so – by assuming an internal, innate mechanism to carry out the (relative) preference procedure – he was able to offer an explicit solution to Plato's Problem that could plausibly be tied into some kind of choice mechanism. By saying what the choices are (choices between sets of rules), by quantifying the procedure, and by assuming that the procedure is carried out by some kind of innate automatically operating mechanism, he could at least state Plato's Problem and outline how to go about solving it. Only by doing so could he or anyone else begin to think about how the language faculty and its growth could be accommodated to biology.

Lacking improved successor efforts, the grammars of the time were descriptively and explanatorily as adequate as they could be. There was also progress in other areas. They were also as universal and objective as they could be conceived to be at the time. In addition, they offered a way to conceive of how accommodation might be accomplished. And they were simple in both a theory-general sense and a theory-internal sense. By the standards of success in naturalistic research, then, Chomsky's grammars made great progress over those provided by the Port-Royal grammarians.

While compared to Port-Royal grammar Chomsky's *Aspects* UG was a considerable advance, compared to later work, *Aspect*'s UG displays many inadequacies. Some were apparent even at the time. A relative choice/learning procedure relies heavily on the assumption that something, somehow, constructs rule sets X and Y in the first place. While it appeared at the time to be possible to compress all natural languages into the same format, only a few had been investigated with any degree of precision, and even these few displayed multiple and – from the point of view of explaining acquisition – unsatisfying

differences that the notion of a common format and some suggestions about innate grammar-constructing devices could not diminish. A substantial notion of universality looked out of reach: different languages alike only in 'formats' looked much too different in details. As for acquisition or an explicit solution to Plato's Problem, while *Aspects*'s procedure 'chose' a grammar with fewer rules (a 'simpler' grammar) over one that had more, this is far from a plausible explanation of a child's managing to acquire any of thousands of natural languages by the same age over the human population, while going through approximately the same stages of development. While a relative selection procedure might be in some way 'mechanized', furthermore, somehow accommodating a theory of language to biology still looked daunting: it was particularly hard to understand how the human genome could be expected to contain all the information needed to allow for any of a large number of languages while providing too for a way to choose between them. Even the most optimistic view of language universals at the time (universals require neither acquisition nor choice) would still demand that the genome carry a massive amount of language-specific information, more than any plausible account of evolution could plausibly explain.

Work after *Aspects* improved the situation considerably. It became more and more apparent that the basic rules/principles and structures of language did not differ that much after all. The phrases of all languages, for example, have heads and complements, and lexical items in all languages seem to "project" phrasal structure in the same way. So apparent differences in phrase structure all but disappear; phrase structure grammar was compressed into a uniform view of lexical "projection." Movement of elements ("transformations," displacement) seemed to become far more tractable; a single rule: "move anything anywhere" was proposed, a rule – it was supposed – that would be constrained by a few other factors. Different languages came to look less and less different. Unsurprisingly, then, the complexion of the dominant explanatory issue, Plato's Problem, changed. Theoretical issues remained concerning where the structures of sentences came from: "projection" replaces multiple phrase structure rules but why is there such an operation, and where did it come from? More progress was made on that front with the introduction of the minimalist program in the early 1990s, to the extent that – oversimplifying and ignoring technical disputes – very recently it has come to seem as if perhaps the sole 'operation' (rule, principle) needed to explain *both* basic structure and movement is what Chomsky and several others call "Merge." Oversimplifying again, Merge is an operation rather like concatenation – putting items or elements (lexical items) together and creating a new item. More carefully: with lexical items x and y, merging forms the set $\{x, y\}$. Something like that is surely needed for there to be language at all, for all languages 'compose' – they make complexes called "sentences" out of "words."

I oversimplified twice to exhibit great improvements in formal simplicity, to the extent that the number of principles needed to provide an account of how any natural language composes sentences out of 'words' might even be reduced to one. My simplifications left out, however – and presupposed – the contribution of an innovation in Chomsky's grammars of the early 1980s, parameters. Parameters allow for structural differences between languages – among other things, the fact that Italian permits sentences lacking (explicit) subjects, while English and French do not. When first introduced – and this may ultimately be correct, at least in part – parameters were understood as options within universal rules or principles (hence the terminology of a "principles and parameters" framework for the study of grammar). These parametric options provide for structural and sound variations between languages – perhaps differences in meanings too, although it is much less clear that there are such differences. They localize the structural differences allowed for within natural languages, to the extent that – as Chomsky put it (see Chomsky 1988a) – by listing a specific set of options, one can 'deduce' Hungarian as opposed to Swahili. In addition to providing a compact and elegant way to describe linguistic differences (ignoring, of course, lexical items), parameters offer other advantages. First, they offer an intuitive way to solve Plato's Problem; they offer a way to conceive of how language acquisition – lexical or word acquisition aside – could be nothing more than the setting of a few parameters. And second, because they allow for improvements in descriptive adequacy *and* come close to solving Plato's Problem by offering what is virtually a selection procedure rather than a relative 'evaluation' procedure, they allow the linguist to begin to address other explanatory issues. Until the 1980s and parameters, it looked as though it would be very difficult to offer in a theory of language a descriptively adequate theory of language that could also solve the acquisition problem. Clearly different languages seemed to require very different principles and rules, and a solution to Plato's Problem seemed to require uniformity and simplicity. If linguistic difference can be localized in a few 'switches' and these can be easily set with minimal data; and if there are very few universal principles, perhaps only Merge, the language-specific 'information' the human genome must carry can be pared down considerably, and the task of accommodating a theory of language to biology now comes to look a lot more manageable. For assuming a theory of UG is a theory of the language-specific information in the genome, because a theory of UG seems a lot simpler than it had for a long time appeared it would have to be, it looks as though the amount of information concerning UG the genome needs to carry is much smaller than originally thought, perhaps Merge alone. (I ignore concepts, sounds, and lexicon here.) Accommodation to biology looks easier. And perhaps one can even begin to explain how language came to be introduced into the human species by some sort of evolutionary procedure.

A simple illustration shows how parameters contribute to making progress and solving problems. Conceive of UG as a set of universal principles. If universal, every language must have the properties specified in the principle. One candidate for such a principle is that all languages must form phrases that consist of a 'head' (a lexical item of some category, such as A[djective/…dverb] or V[erb]) and a complement, which is itself a phrase, and may be null. Formalizing a bit, XP = X – YP, with 'X' and 'Y' being any of V, A, P[reposition/postposition], D[eterminer]. This is primitive, but it will do for illustration purposes. Think then of this principle as being parameterized, as allowing options. The options are represented in the formula's '-', which is unordered. If unordered, heads in a language could be before their complements, or after. English is a "head first" language, so that a VP comes out "call the dog." Japanese (Miskito, etc.) is a "head final/last" language, so its phrases put heads after complements. If English were head-last, the example would come out: "the dog call." This parametric option – and others – can be seen as something like a switch that in one position yields a head-first language and in the other, a head-last. Assume (plausibly) a finite, and presumably small number of linguistic parameters. Specifying the full set of linguistic principles and their parameters would, then define the possible structures of the class of all natural languages, each of which is biologically and physically possible. A specification of this sort would 'say' what a biologically/physically possible structure for a natural language could be. If there were 12 parameters and they were binary and independent of one another, there could be 2^{12} structurally different languages. Assuming all this, principles and parameters offer very useful descriptive tools; they allow for the description of all possible natural languages with regard to at least their structural and sound differences, allowing a reduced UG to offer adequate descriptions of any possible natural language.

As indicated, they also offer a solution to Plato's Problem, a dominant explanatory problem that, until solved, blocks dealing with other explanatory issues. Conceive of a parameter amounting to something like a toggle or switch; in the case of the illustration, when the switch is in one position, one has a head-first language, when in the other, a head-last. Think then of a major part of language acquisition as a matter of setting switches in one of the few positions that each parameter allows – in simple cases, position 1 or 2. This picture does not speak to lexical acquisition – or at least, not directly. Language acquisition requires acquiring a vocabulary too. But it does make a major contribution to the task of solving Plato's Problem with regard to language – the combinatory system. It also suits the facts. There is evidence in favor of the idea that children do set parameters in the course of developing a language. Some of the most interesting evidence is found in the fact that at specific stages of language development, children's minds 'experiment' with parameter settings, trying out settings that are *not* typical of the languages spoken in their communities,

soon converging on the 'right' settings for the data they receive. A child acquiring English, for example, might say "What do you think what teddy wants?", displaying a sentence with a second 'what' in the same position as one would find it in some varieties of acquired German. This and related patterns of experimentation might appear occasionally in a child's speech for a short while, and then disappear. It is as if the mind were exploring the avenues open to it. Because parameters are fixed, the mind's choice space of alternative structures is very limited, and pre-specified; 'choices' are made quickly, on little evidence – in this case, a lack of evidence for one of the possible settings, some evidence for the other. The parameter picture makes nice predictions too. Without parameters, we would not find the predictable periods during which this kind of 'experimentation' takes place, nor the swift learning rates (often without negative evidence), unless the choice space were set innately. If all sorts of possibilities were available – if the choice space were open – children's linguistic behaviors would be close to random, and eliminating some possibilities and selecting others would be very difficult without a lot of outside intervention – intervention that the child in fact neither receives, nor needs.

By solving Plato's Problem, parameters allow the theoretician to begin in a serious way to consider other explanatory issues, including how one can accommodate language to biology and address how language came to be introduced into the species. I will focus on accommodation – effectively, placing UG in the genome – and on some of the most recent advances. Recalling, the most plausible route to accommodation consists in minimizing UG, where UG is thought of as the language-specific 'information' the genome must have in it in order to provide for human languages. To determine that, ask what the *sine qua non* of language is – what it is that humans *must* have to have language at all, where this is demonstrably something that no other species has. In an important contribution to *Science* in 2002, Chomsky along with Marc Hauser and Tecumseh Fitch compared humans to other species with various communication and other systems. They pointed out that other species seem to have at least some of the conceptual materials we express in language, and that other species can both articulate linguistic sounds and signs and perceive them. But no other species has linguistic recursion, the capacity to take lexical items/words and 'compose' them, producing hierarchical structures of – in principle – indefinite length. Assume, then, that the *sine qua non* of language is linguistic recursion – which is due, as indicated above, by Merge. Merge, then, *must* be specified in the human genome in some way. But could UG be Merge alone? If it were, accommodation would be much easier. But what about parameters? They definitely have a bearing on grammatical/computational structure, and as stated, they seem to be language-specific. For example, the order parameter I spoke of above looks language-specific; its terms are heads and their complements. If it is, it must be in UG. That is *much* less daunting. But we should not

assume anything like that so quickly. One good reason not to is that as those who have been working on the very difficult problem of explaining species variation knew long ago, there is a lot more to development, growth, and morphogenesis than can be explained by the genome and 'input' (data) alone. The same must surely be true of language growth and development in a child. These other factors – Chomsky calls them "third factor" considerations – include

> (a) principles of data analysis that might be used in language acquisition and other domains [and] (b) principles of structural architecture and developmental constraints that enter into canalization, organic form, and action over a wide range, including principles of efficient computation, which would be expected to be of particular significance for computational systems such as language. (Chomsky 2005: 6; see also 2007, forthcoming).

No one really knows what these factors are with language – or with the growth of almost anything else, for that matter. But superficial appearances to the contrary, it is not *obvious* that differences of order in phrases (as with the head parameter) *must* be language-specific: perhaps the order of head to complement is fixed by something not specifically linguistic. And it *is* obvious that variations in the patterns of colors on individual pigeon wings (and in the feathers themselves) cannot be attributed to an individual pigeon's genome alone: that would put far too heavy a burden on it. So perhaps parametric options are to be explained by appeal to third factor considerations, and their 'setting' to variations in values provided by these considerations.

Biologists and others working on issues of growth (morphogenesis, ontogenesis, and the like) have increasingly come to take third factor contributions to growth into account within the growing science of "evo-devo," short for "evolution-development." In fact, Chomsky has been pointing in this direction for some time, going back to his earliest work. Principles of computational cyclicity and principles of data analysis played a role in early proposals concerning acquisition (Chomsky, Halle, Lukoff 1956; cf. Chomsky 2005: 6–7). In more recent years, he emphasized the relevance to issues of language variation and growth of Alan Turing's important work on morphogenesis and D'Arcy Thompson's earlier and less formal work on related matters, and he often refers to the work of biologists such as Stuart Kauffmann and Charles Waddington. These all revitalize a line of thought in biology that goes back at least to Goethe and his belief that he could predict the possible shapes of any plant by appeal to a formula for an "Urpflanze" (primordial plant). Note that *CL* includes an explicit reference to Goethe's speculation and to the way in which what Goethe had to say might speak to matters of language's generativity and – through that – to one precondition of linguistic creativity. In any case, third factor considerations have been lying in the shadows of the study of language, apparently waiting for a good solution to Plato's Problem. A solution to that – and consequent clarification of what *must* be attributed to the genome – was a precondition of asking what the third factor contributions might be.

I will not pursue the matter in detail, but it is interesting to see that if these speculations (but not *mere* speculations) are on the right track, so that Merge alone is 'contained' in the genome, it becomes much easier also to explain how language could have come about as the result of a single mutation. It need not be a "language specific" mutation; it could, for example, be a side result, the result of what Lewontin and Gould (1979) spoke of as a "spandrel" – a structural result of a modification in some other system. It must, though, be 'saltational' – happen in a single jump – for otherwise we would have to suppose that language developed over millennia, and there is no evidence of that. In fact – speculations about FOXP2 in the media and technical journals aside, which are likely to be irrelevant anyway – the only apparently relevant evidence indicates the contrary. Humans seem to have begun systematic observations of the stars, attempted to find 'ultimate' explanations (found often in religions), produce drawings, develop ways to cope with their environments in systematic ways, and the like, between roughly 100,000 and 50,000 years ago – for about 50,000 years ago is when the migration from Africa began.

Investigation of speaking humans widely separated (so not interbreeding) since then – e.g., in Southeast Asia – indicates full linguistic capacity and suggests that no significant change has taken place since then. Plausibly, capacity to engage in distinctively human forms of cognitive behavior – art, religion, empirical investigation – came about not only suddenly by evolutionary standards, but as the result of the introduction of a single change. An introduction of language – more precisely, recursion and, specifically, the capacity to put concepts together to produce an indefinitely large number of complex concepts that can be used freely – is the most probable cause. If this story is plausible, a humanoid species in effect "became human" as the result of the introduction of language.

This kind of naturalistic and reason-based account of the origin of humans and of their cognitive capacities – one far removed from various religious myths – is an explanation that would have pleased the Enlightenment figures who thought that reason alone is sufficient for answering fundamental questions. Of course, one cannot afford to be overly enthusiastic. If reason (the use of our cognitive capacities) has the biological basis it seems to have, reason must have its limits. Those limits are revealed in an incapacity to make scientific sense of the creative aspect of language use, among other things. But actually, that is a good thing. Without limitations on cognitive resources (innateness) – as the RR thinkers insisted – there would be little in the way of intellectual capacity at all.

Notice that this account of the origins of humans and of the introduction of language (arguably the key to their remarkable cognitive flexibility and power) leaves ample room for what both rationalists and romantics honored – free will. The internal operations of specific mental faculties such as vision and language

may well be determined. These computational systems take what is provided them – in the case of language, lexical items with their phonological and semantic 'information' – and yield complex kinds of 'information' at their interfaces with other cognitive systems. If they do not they crash. At least with language, however, what happens on the *other* side of the semantic interface is – as the creative aspect of language use reveals – not determined, although it seems to be 'rational,' for 'what is said' is typically appropriate to discourse context. Furthermore, given that human action involves contributions from multiple, cooperative systems, and that the relations between multiple systems are subject to massive interaction effects, there is no prospect for determinism, or – as we have seen – for a science of human behavior. Given furthermore that 'free will' is well-attested in personal experience and in the use of commonsense understanding, we might as well say that humans are free agents, period. There is no reason for regret in this. We have reason to celebrate.

Finally, it is worth mentioning briefly a matter taken up in more detail in the final section of this introduction, for this current section's focus on progress in accommodation of language to biology also illuminates some of the broader themes of *CL*. Implicit in Chomsky's efforts to place the science of language in a prominent place in a biologically based science of human nature is the idea that we might be able to tease out of a science of a distinctive human nature some notion of what humans fundamentally need, and begin, with that in mind, to think of what kind of social organization – polity – could best satisfy those needs. We might, by doing this, provide justifications for political recommendations and policies and for political and economic institutions generally – institutions that have the purpose of meeting those needs to a maximal extent. The appeal of such a science-based project is clear: justification must appeal to universals, here provided by an objective science of a distinctive human nature. (Language is obviously a constitutive element in a distinctive human nature; no other creature has it.) An objective science of human nature can stand the burden of scientific justification. And it can in turn offer the means to do what Enlightenment thinkers would have been delighted to do if they could: take an account of human nature got by reason (without appeal to faith, dogma, or authority), use it to determine fundamental human needs, and – with an understanding of these – make an effort to construct a justifiable view of what an ideal form of social organization would look like. It would be a long process (and may be impossible, for like all biological creatures, we have cognitive limitations), but one would end up with a scientifically based form of humanism, one built on the idea that humans are biological entities, and nothing but. Not faith, but reason – particularly scientific reason, which aims towards universality and objectivity – could provide a reasonable basis for a view of "the good life" and of an ideal form of social organization that permits people to live such a life.

III Descartes's contributions

Descartes made no direct contributions to the science of language, but he did make indirect ones. I do not include among those contributions any of the claims with which he is in many philosophers' (and their students' and readers') views all but identified. Specifically, there is no reason to think that the scientific study of language or mind is aided by Descartes's (perhaps only apparent) view that a person has direct, unmediated and certain knowledge of the mind's contents. Nor is there reason to take seriously his mind/body substance dualism – although it was (as I indicate below) a sensible proposal at the time he wrote. And his foundationalist epistemological project – some hints in it about what he thought about the methodology of science aside – has little to recommend it, and can be ignored. Certainly these aspects of Descartes's thought play no role in any of Chomsky's work, nor in a substantive way in the work of others now working within what has come to be called the "Chomskyan paradigm." Nor do they figure in the discussion of *CL* in any substantive way.

III.1 Natural science

Descartes's real contributions – the ones that then were and still are viable – are found elsewhere. First, he helped invent the methodology that yields natural sciences. His insistence on taking the methodology of science to be very different from what one finds in the practical problem-solving efforts of humans trying to get along in the world, where they use the innate concepts of common sense (which he called "bon sens") is reflected in the first part of his *Discourse* in his autobiographical reflections on how little he had managed to gain from his education in the "letters." Even his study of mathematics in the schools, he remarked, was misdirected; he assumed that its uses were practical – for engineering, architecture, and the like. It was only later that he discovered its use in science, where mathematics provides the formal tools for capturing principles and constructing theories that deal with phenomena well out of the reach of common-sense concepts. When used in this way, they are essential aids in idealizing, in constructing and focusing study and experimentation on simple, abstractly described models of phenomena. Galileo made a similar point when he aimed towards mathematical descriptions of the factors that contribute to the motion of bodies: rates of acceleration and changes in them when falling and rolling down inclined planes, for example. He also constructed mathematical descriptions of the motions of pendulums, noting the effects of lengthening the wires or rods by which they are fixed. You do not get sciences of complex phenomena such as the growth of plants by starting at the top. You focus on the elements that you hope will eventually contribute to an explanation – on contributions that, taken with other contributions, bring about the complex

phenomenon. At each stage, you invent theories that idealize phenomena, experiment by trying to control for irrelevant contributions, and so on. The theories might well end up postulating properties, forces, and entities completely foreign to you. In fact, you better expect that. Invention can and often does go beyond everyday experience.

A related point is found in a distinction Descartes made in his "Comments on a Certain Broadsheet" (CSM I, 303–4) where he explains his view of innate concepts (or 'ideas'). There are two sorts, he argued, those that lie in the mind from birth such as TRIANGLE, and those that are "adventitious," meaning that they require some kind of occasion or triggering data to come into operation. His example was the "common view" of the sun, offered to all of us by the innate but adventitious (common-sense) concept, SUN. These two classes of innate concepts are clearly distinct from another SUN-concept, one that is "made up" (created, manufactured) by the scientist who constructs a theory of the sun. Naturalistic theory-construction is clearly different from practical problem-solving, such as deciding whether to plant at noon in full sun, or limit your efforts to the early morning or late afternoon. The 'common' concept/idea of the sun serves practical problem-solving well, and these concepts are available to everyone. We use them all the time – when, for example, wondering whether to get up before the sun or linger for an hour. But the common concept of the sun is of no use to the scientist. In science, the sun does not rise, nor set, nor move across the sky. In science, common-sense concepts provide little guidance; one must follow instead what Descartes called "the light of nature," plausibly understood as seeking simplicity in nature by making one's theories simple, theories that are then tested in experiments that control for irrelevant factors. Similar points are made in Descartes's skeptical reflections: if we want full explanations of phenomena, we cannot rely on the view of the world and the things in it that common sense gives us. We cannot assume that that piece of paper out there is yellow, or – as with Chomsky – that language is some kind of public institution, learned from parents and friends, described by appeal to rules for 'correct usage'. Taking the route of seeking simplicity, one is led to producing formally explicit abstractions removed from everyday understanding, and hoping that these can be integrated with the findings of other scientists, and other sciences. The point is fundamental to making progress in any science. Like Galileo and Descartes, Chomsky often remarks on the need in the scientific study of language to idealize and construct theories. Only by doing so can one hope to get anywhere.

Descartes helped initiate natural science, a project that people can undertake that at its most general level is a strategy for research, or a methodology. The scientist, whatever domain s/he investigates, seeks descriptive and explanatory adequacy in a theory of natural phenomena; s/he demands simplicity and, to get it, constructs formal and explicit theories that idealize the phenomena under

investigation; s/he seeks objectivity and to get it, abandons the anthropocentrically oriented concepts of common sense that prove so useful in resolving practical problems but fail in attempts to construct objective theories. When Descartes followed these principles, he enjoyed for his time remarkable success. He provided a detailed account of optics, dealt in an interesting and still-current way with neurophysiology, offered a cosmological theory, presented and defended a contact mechanics that he tried to turn into a "theory of everything," and even pointed plausibly in the direction of a computational theory of vision. Despite offering the rudiments of a computational theory of vision, however, he balked at applying these methodological desiderata to the mind to develop sciences of the mind.[24]

III.2 Linguistic creativity

One possible explanation for Descartes's reluctance to venture into the mind by using the tools of science lies in Galileo's experience with the church. Descartes might have been unwilling to appear to be offering a naturalistic account of the mind, or what the church authorities might have thought the soul. That motivation, if it was one, is of little interest to us. The other is relevant, and important. It is found in his effort to take the creative aspect of language use observations into account by using the tools that his sciences gave him, especially those found in his contact mechanics. We have seen already that linguistic creativity observations are important for the science of mind – at least, for those who adopt an RR strategy. Here I discuss them in more detail and describe Descartes's inadequate attempt to contend with them. There are lessons in his mistakes, mistakes that were excusable at the time, but are no longer so.

Descartes's creativity observations appear in Part V of the *Discourse* after a lengthy effort to try to show that a contact mechanics could be used to deal with everything – cosmology, neurophysiology, optics, and so on. As he understood the situation, a contact mechanics proved sufficient for describing and explaining anything and everything having to do with "body." The creativity observations indicated that some phenomena lay outside the scope of science as he understood it. They seem to be explicable only by something like a "creative principle," and creativity is absurd from the standpoint of a deterministic mechanics. If science fails here, he reasoned, it must be because something non-bodily is at work. Giving it a name, he called it "mind."

Descartes assumed, essentially without argument, that a person knows in his or her own case that s/he has a mind (in his gloss, that s/he is a rational, thinking being). To decide whether others – humanoid organisms, animals, or machines – have such minds, he suggested observing their linguistic behavior when asked questions or otherwise prompted to speak.[25] Observing the way they use language is, he thought, sufficient to conclude that one is dealing with a

human, not a zombie, automaton, or animal. It suffices, he thought, because when humans use language – and he was careful to point out that he meant humans across the spectrum of intelligence and apparently without regard to education and social position – they display a form of linguistic creativity that is not duplicated in the behaviors and actions of any non-human organism that has been trained to produce linguistic sound or signs, nor machine that has been built or programmed (or 'taught' itself through exercising some kind of generalized learning procedure) to produce linguistic sounds or signs.[26] He said,

> [No such animal or machine] could … use words, or put together other signs, as we do in order to declare our thoughts to others. For we can certainly conceive of a machine so constructed that it utters certain words, and even utters words which correspond to bodily actions causing a change in its organs… But it is not conceivable that such a machine should produce *different arrangements of words* so as to give an *appropriately mean ingful* answer to *whatever* is said in its presence, as the dullest of men can do. (Descartes 1637/1985 (CSM II): 140; emphasis mine)

Glossing these remarks, his observations note that people, unlike machines or animals, can put together any of an unbounded set of sentences and manage nevertheless to bring what they put together to bear in a way that seems appropriate and coherent ("rational") for the *discourse* context (not local spatiotemporal context of the speaker or hearer) in question. Nothing in the environment *causes* the sentences produced: while a question or comment might prompt or incite someone's linguistically expressed thoughts or utterances, they do not cause it. You can ask someone how best to get to Cambridge, no matter where you are located. If they have an idea about how to do this at all, they will no doubt come up with a set of sentences, each sentence differing from the others the person uses in the detailed description given, and each differing again from those that that person will produce at another time for another person asking the question, and differing too – obviously – from what others might produce then or at other times. And yet these clusters of sentences differing from one another and, within a cluster, differing from each other again, typically offer appropriate, coherent answers to the request. There is no upper limit on the set of sentences for performing this task, or other specific tasks where language might be employed. 'Unboundedness' seems to be a property of sentences produced in discourse contexts across the board, whether those contexts bear on requests for information, attempts to persuade, criticisms of actions performed, gossiping remarks, attempts to be humorous, efforts to excuse one's actions, etc. – or, in the case of thought, perhaps no verbal or other prompting at all. Humans seem to be able to produce an unbounded number ("different arrangements of words") of sentences without causal antecedents (that are externally and internally "stimulus free") although perhaps prompted (in Descartes's time, "occasioned") by questions or other factors, while remaining appropriate and rational in what they produce. Clearly, their production cannot

be the result of some deterministic mechanism that offers the answer it is caused to produce, nor even of a mechanism that, given a question and a context, provides one of a specifiable (and thus bounded) range of answers. If someone insists on the opposite, they are hereby challenged to come up with the mechanism, for no deterministic system can yield any of an unbounded set of sentences, for a specific discourse context, all of which are coherent or appropriate. If the conceptual difficulties involved in this do not convince, then lack of success coming up with a science of such a mechanism suggests that those who insist on a deterministic mechanism are on very thin grounds indeed.

Descartes expresses his test in terms of conceivability, not observability. Obviously, though, his test is readily applied. In the case of animals such as the chimp Nim Chimpsky (the subject of a massive effort at Columbia University in the 1970s to get an ape to learn sign language) and other primates, it arguably has been, although – because no ape has managed to learn even the rudiments of syntax and morphology for human sign language – it is difficult to distinguish failures due to creativity from those attributable simply to lacking language. A closer approximation to human speech, it is thought, might be found with machines; they can be programmed to produce orthographically represented sentences on a terminal or printer, or even relatively realistic voices. Applying Descartes's test to machines, a candidate speaking machine would have to satisfy one or more persons that what it produces in response to questions (keyed in letters and words, perhaps) are *as appropriate as* those of a human asked the same question. If a machine's performance is judged no differently than a person's, that might be a reason to say that the machine thinks. Alan Turing (in Turing 1950) re-invented Descartes's test and predicted – too optimistically – that a computer program would be able to satisfy one or more persons that its responses to questions were as appropriate as a human's. Adapting Turing's test, a competition was created (the Loebner competition) which awards a machine program that can manage to convince a jury after a designated period of interactions with two terminals, one controlled by the program and the other by a person, that the machine's responses to jury questions are no less appropriate than the responses one gets, or expects from, a person. No program has won the grand prize, which allows unrestricted questioning, without regard to subject or context – in effect, Descartes's test, although with a limited time period.

Notice that the test assumes that an arbitrary human (with competence in the relevant language) can understand what an animal, machine, or human says (or 'says'), and manage to administer the test. That assumption raises the question of what resources humans have available to understand and judge the appropriateness of what is said. Obviously, no one relies on a causal theory of human linguistic behavior; if we had such a theory, we could predict what machine or person will say, or at least limit the set of answers that could be produced; we

would be in the position of a god, and no doubt quite bored with humans and their pretense to novelty and creativity. That kind of fantasy is a philosopher's indulgence, at best; there is nothing to recommend it – nothing in experience or science to take it at all seriously. And it has no bearing on the issue of what a human mind has available to interpret what another says, and judge its appropriateness. We know from discussion in Part II that we have many such resources, including common-sense 'folk' principles, common biologies, environments, interests, etc. – generally, shared biologies and discourse-context information plus anything one gets from familiarity with the speaker. It is hardly surprising that no program has passed the unrestricted Turing/Descartes test. Machines aren't people. They simulate human *behaviors* in carrying out specific tasks – often besting them where dealing with restricted contexts and specific problems. Computers can win at chess. But they do not play chess the ways humans do.

Descartes 'explained' creativity by attributing it to reason; he even went so far as to claim (see *CL*'s text) that reason is a universal instrument, able to solve any problem. The self-contradiction is obvious: it cannot be a universal instrument if it cannot deal with linguistic creativity. We do much better by attributing creativity to humans with the biologies they have, biologies that give them the cognitive capacities that they have, including a capacity to produce boundless numbers of sentences and understand and interpret them. And we can assess the appropriateness of sentences with respect to discourse contexts that we can appreciate. We can appreciate them by being, like the speaker we interpret, humans with the innate resources we have.

Apparently, our sciences cannot deal with creativity and – given the reasonable assumption that language and the cognitive resources it offers will shape and play a constitutive role in most of what we understand about ourselves and the world, and in how we deal with the multiple problems that everyday life poses – our sciences are inadequate to deal with human action and behavior in that very wide range of cases in which sententially expressed concepts play a constitutive role. We can, nevertheless, develop sciences of the mind by focusing on specific internal systems. Chomsky's science of language, as we have seen, is a theory of such a system; his aim is to produce a "generative" theory that individuates a language by appeal to a set of principles or laws that takes arbitrary selections of specified sets of lexical items and returns a sound-meaning pair, a sentence; else the derivation crashes. This is a deterministic theory. It cannot explain how we manage to use language creatively; it does not explain linguistic behavior/action. But it can and does contribute to making some sense of how that readily observable kind of creativity is possible, and why it is available only to humans.

Summarizing, 'ordinary' linguistic creativity is uncaused, unbounded/innovative, and appropriate/coherent. Explaining why it is available only to humans

is easy: so far as is known, only humans have language faculties, and these are organic systems in a brain/mind that has multiple systems, some of which the language system 'communicates' with.

Explaining how creativity is possible is not scientific explanation, but a matter of taking what is known in the science of mind – and especially language – now, and trying to make sense of linguistic creativity's readily observed features. Beginning with being uncaused, it is plausible to suggest that it must have something to do with the fact that the mind is modular, and that language in particular is not only modular, but neither an input nor an output system. To say it is modular is at least to say that it operates in accordance with unique principles, taking system-specific inputs and providing system-specific (to the faculty) outputs. To say that it is neither an input nor an output system is to say that it is not tied closely, as sensory or output systems are, to dealing with signals and other forms of input from outside the head, nor to the direct production of bodily movements. These characteristics of the language system do not provide a fully satisfactory account of the apparently great degree of autonomy the language system displays. But they make a plausible contribution, and may be the best that we can offer.

Unboundedness or innovation plausibly has something to do with the language faculty's 'productivity'.[27] A generative theory of language, if correct, suggests that the language faculty can provide at the "conceptual-intentional" interface(s), in principle, an unlimited number of "perspectives" (to use Chomsky's term for them). These perspectives can be thought of as complex forms of concept – essentially, sententially 'expressed' concepts. The unlimited set of possible outputs is a discrete set: each complex item (sentence/expression/sentential 'concept') is in its structure and character distinct from any other. Intuitively, the theory explains why an 'understanding' of one sentence is distinct from an understanding of another or, to use semi-technical vocabulary that avoids the direct use of charged words like 'understand', it indicates that the internal or intrinsic content of any one sentence that a person's I-language can 'generate' is distinct from that of any other. It is so because language relies essentially on a recursive procedure that yields hierarchically structured expressions, and each expression consists of two complexes of features at language's "interfaces," the phonetic interface and the semantic. Expressions have these characteristics because of Merge, an operation that combines arbitrary 'concepts' (meanings of lexical items) to yield through phonetic features 'sound' instructions to articulatory and perceptual systems, and through semantic features, 'information' for the conceptual–intentional systems with which language 'communicates'. Various constraints limit the total understandable perspectives available to *persons*, the total of perspectives available for their use. These include memory constraints, 'parsing' constraints, some forms of embedded construction, and so on. But by any measure, what remains is

massive expressive power – by reasonable estimates, more comprehensible sentences for people with moderate vocabularies than they could produce or listen to in their lifetimes. So far as making sense of the creative aspect of language use is concerned, this is plenty. All that is asked is that for any given linguistic 'task' (suggesting, describing, querying, scolding, gossiping…) and any given discourse context (and its "immediate focus of interest," to recall Strawson's phrase (in Strawson 1950)), there is no way to set an upper limit on the set of sentences that can be understood and produced by a speaker, even though every such sentence remains appropriate.

What of appropriateness? If language production were *caused* by the current circumstances of the speaker, no issue of appropriateness of linguistic actions could arise. One could, of course, ask if a causally determined 'cognitive' system that presumably evolved yields outputs that increase an organism's chances of survival, or something like that. But thinking of the appropriateness of sentences produced by people (out loud or in thought) in this way indicates complete misunderstanding of the issue. Appropriateness of linguistic action poses a problem *because* human linguistic actions are uncaused and innovative. Humans must choose 'what to say' about some discourse circumstance and some task to which language contributes, and the choices are always open ones. It is wrong to think of the choice as solely one between telling the truth and telling a lie – changing, say, a sentence's 'is' into an 'is not'. That kind of choice could arise only where one is asked to (say) describe something, not (perhaps) complain to customer service about the amount of time they required you wait on the phone before they responded, or (perhaps) construct a fable or a parable to get a view across to an audience. And even if it were just a choice between truth and lie in carrying out a task of describing, unbounded ways to tell the truth are available, and again unbounded ways to lie. Given all this, the most one is likely to be able to do by way of showing how appropriateness is possible is to note that, first, judgments of appropriateness surely require drawing on resources that go well beyond the language faculty alone. They involve multiple other systems in the head. Second, one must keep in mind that in dealing with multiple modular systems 'communicating' with one another over their 'interfaces', it would hardly be surprising to find that dealing with the total output of a complex of systems is well beyond the scope of any science that human being seem to be able to construct. For dealing with the output of multiple systems operating together would require a way to deal with massive interaction effects. Since cosmologists have a hard time producing a theory that will determine the states at any given time of three point-mass 'bodies' moving with respect to each other, and find four or more completely out of range, we should hardly be surprised that theories of complex interactions between multiple mental systems are likely to remain out of the reach of the sciences now, and for any future where we humans have the cognitive resources we now have. Judgments of the

appropriateness of what someone else says can require mobilizing all of one's own mental resources. We manage quite well, to be sure. But we manage not because we are all well-trained members of a linguistic community, nor (obviously) because we are omniscient gods, nor (obviously again) because we have deterministic theories, but because we and the speaker are all organic creatures that have the cognitive resources humans do, and they use all that they have available and need to employ in 'interpreting' and understanding (as a person) what another says.

Focusing again on Descartes, his observations apparently led him to abandon any serious effort to construct a science of mind. He tried to explain the apparent limitations on science's capacity to deal with creativity not by appeal to the points made above, points that presuppose that sciences of the mind exist that meet the methodological requirements on science that he helped introduce, but by appeal to the idea that mind is just a different substance, Mind. In doing so he effectively placed the mind out of the reach of the most all-encompassing science he had managed to construct, his contact mechanics. Assuming as he did that the subject matter of that science is passive 'body', assuming further that his contact mechanics served as something like a theory of everything (he thought of his neurophysiology, for example, as a special case of it), and confronted as he was by the obviously non-passive creativity exhibited by human minds, 'explaining' creativity by introducing a non-body substance had the effect of putting the mind out of reach of science as constructed until then (but see note 24, above).

Descartes himself made no obvious errors, given what was known at the time. The errors, it turned out, lay in his contact mechanics, but they were not to be revealed until a half-century later. As Chomsky points out in several places (Chomsky 1988a, 1996, and 2000), a crucial error was revealed by Newton when he pointed out that contact (and thus a contact mechanics) cannot explain gravitation.[28] Describing and explaining gravitation requires postulating a force that is completely mysterious to someone wedded to a contact mechanics: 'action at a distance'. Descartes's contact mechanics failed, and along with its failure went the assumption that all physical action is by contact. His contact mechanics cannot serve as a science of everything. In fact, it cannot deal with elementary features of the physical world. Had he known, he might have come to the conclusion that there isn't such a barrier between mind and 'physical reality' as he thought there was. For if 'physical reality' (the reality physics deals with) is not 'body' as he originally conceived it within a contact mechanics, one has to allow for what from the point of view of contact mechanics seem mysterious forces. If, moreover, these forces can only be understood by appeal to a formal mathematical theory, nature begins to look like something that we can no longer use common-sense intuition to understand. Science and its formal tools offer a better way, however unintuitive what they tell us might seem. If so,

we should take seriously the possibility that our intuitions about 'body', those built into the 'mind/body problem' as understood by Descartes and since, are unreliable. And we should allow that 'body' for the sciences does, after all, countenance mental properties and events. The apparent barrier Descartes's intuitive but wrong conception of body posed to constructing sciences of the mind disappears. We can begin to construct 'physical' sciences of mind that, methodologically speaking, meet all the conditions on natural scientific investigation. Descartes did not take this course, and for understandable reasons, given his assumptions.

Unfortunately, even many philosophers and others after Newton have missed the implications of Newton's discovery. They seem not to have noticed that there is no block to constructing 'physical' sciences of the mind. A block exists only if Descartes's contact mechanics is correct, and its understanding of 'body' taken seriously. If the scientist must abandon Descartes's conception of body and 'physical theory' ends up – as it does – postulating all sorts of forces and 'entities' that are mysteries for Descartes's conception of 'the physical,' one might as well say that any science that meets the requirements of successful naturalistic science is a 'physical' science too. Following this line of thought to its conclusion, Chomsky (following Locke, Priestley, and others before them), often points out that there is no mind/body problem (1988a).[29] There cannot be until some sciences of the mind and the physical world that meet the requirements on being good sciences show that their subject matters really are incompatible, as they were for Descartes. Until then, perhaps philosophers who are interested in a real problem as opposed to a Wittgensteinian *Scheinstreit* should abandon the so-called "mind/body problem," for ever since Newton's time, it has not existed.

The problem creativity poses for the science of mind remains, of course. But as we have seen, it is dealt with by adopting an internalist and nativist strategy that recognizes that we have limited cognitive capacities, and by noting that any action – including speech – is the result of a massive interaction effect. We can – and in this case do – make sense of how some aspects of creativity are possible. But we certainly do not abandon the science of mind entirely, nor adopt a close analogue to abandonment, the methodological dualism favored by empiricists.

III.3 A computational theory of mind

One can understand why Descartes put the mind out of reach of the science of nature. But it put naturalistic research in a narrower and – surely – stifling box. Among other things, it left Descartes with no plausible account of how ideas could be innate. He noted in *Comments on a Certain Broadsheet* (CSM I, 303–4) that the innateness of ideas is like the disposition to develop certain diseases that one finds in some families. A disposition to develop diseases

demands scientific explanation by appeal to the processes of reproduction and inheritance. But placing virtually universal (across the human species) ideas and other mental conditions (sensory colors, sounds…) in the mind ruled out that 'physical' or naturalistic way of accounting for their universality and early acquisition. Calling on God – as Descartes sometimes did – to explain innateness in this domain is no help. He would have benefited from placing the science of mind in the domain of natural scientific research that he helped invent.

Arguably, he was on the brink of constructing such a theory for the sensory qualities of vision – that is, for the characteristic ways in which our minds configure our visual experience in the ways familiar to anyone with vision (color and spatial volume at a moment – a retinocentric space). He argued – in part on poverty, in part on non-resemblance,[30] in part on uniformity across the species grounds – that the sensory qualities of vision are both mental and innate.[31] Given that he assumed that these are innate and universal, even though mental, he could and perhaps should have come to recognize that, as with disease, there must be some naturalistic explanation for how infants come to sense visually in the ways all humans do. There is, of course, no guarantee that naturalistic scientific research into a domain will lead to success, but poverty and uniformity observations surely offer reasonable grounds to assume that it will.

Assuming innateness and mentality ('being in the mind'), the work of poverty, universality, and non-resemblance observations is done. Thereafter, one proceeds in the way all scientific inquiry does: observe phenomena apparently within or relevant to the subject matter you are investigating, note differences, construct formal-mathematical descriptors of postulated entities and events, aim toward precision, put together hypotheses, aim to explain puzzles and anomalies, develop causal principles, detail algorithms, and the like. To see what Descartes had accomplished, and to point to what he could have reached for, I appeal to contemporary work in constructing a computational theory of vision – its aims and the tools it employs. There are several tasks for a theory of vision, but a central one is accounting for how 'inputs' in the form of firing rates of various cones in an array in the retina (ignoring rods, in order to focus on colored-shaped visual spaces), reacting to impacts of photons, are 'processed' in the various parts of the visual system (retina, lateral geniculate nucleus, and various brain visual areas) to yield 'what one sees' at a moment. The procedure – rather a complicated one[32] – is captured by appeal to mathematical descriptions of the operations that the various parts of the visual system – descriptions that indicate how rather messy input is 'processed' to yield a colored volume with greatest resolution in the center (due to the fovea's greater concentration of cones). Idealizing, one ends up with a volume/space where spatial positions are assigned by means of altitude, azimuth, and depth

coordinates fixed on a momentary line of sight (which makes the volume retinocentric), and where each distinguishable point in the volume is assigned 'color' values of hue, brightness, and saturation. In effect, one ends up with a map of the finest color–space discriminations of which the human visual system is capable at a moment. This map can be used to describe 'what is seen at a moment' in color and spatial terms, for any normal human organism. All that is required is a specification of the 'input' values for the retinal array. The theory provides a much finer-grained description of the colors and (retinocentric) spatial positions than does anything like "red surface there now." Generally, the science of vision can produce much better descriptions of qualia – rather, of possible total qualia spaces at a moment – than can the color and position terms of natural languages. It does not, of course, describe colors and experience of space "from the inside" – whatever that might mean. But given what it can do, that surely does not matter, and for any serious work on "what one can see," it does – or aims to, when complete – do as well as humans are likely to be able to do.

Chomsky's linguistics has much the same aim: given an I-language specification of a person's lexicon at a time,[33] plus parameter settings, it is possible (in principle) to specify the set of linguistically expressible "perspectives" that that I-language has to offer. That is, it is possible to map "what can be meant" (in the linguistic technical sense of "mean" – i.e., possible SEMs. Naturally, that is a long way off, but it does indicate what the ultimate aim of a computational theory in another faculty aims towards. There is an important difference between SEM-mappings and retinocentric space color-volume mappings: in a way, the visual mapping does capture possible experiences, while SEM-mappings remain out of touch of consciousness. Both represent, however an 'output' level of a system, and the theory of the system says what they can be.

It is certainly no fault of Descartes that he did not offer anything like a complete computational theory of vision – any more than that it was his fault that he did not anticipate Newton. But he did, I think, begin to move in what we now think of as the right direction. For one thing, he realized that vision depended on processing that can and must be represented mathematically; he was on the way to a computational theory. Second, on the determination of visual depth, he made a crucial observation: the visual system utilizes ocular convergence measurements (it utilizes much more, but this is a central contribution). He came to this view, in part, by noting that the blind can tell the distance from them of some object – that is, judge depth – by using a couple of sticks that they hold in front of them that touch at their tips. They – or, surely, their minds – calculate the distance from the angle that their hands and converging sticks subtend. Descartes also noticed that the eyes converge more when a person looks at a nearby object and less when it is further away. Noting the parallel between what the blind do and what the eyes 'do,' he drew the

conclusion that "we perceive [depth] by means of our eyes exactly as we do by means of our hands" (*Optics* in CSM I: 169). In modern terms, he realized that the vision faculty computes depth by (in part) measuring the angle of convergence of the eyeballs at which their retinocentric images fix on a single focal point. The result is *sensed* depth, note, just as the colors of vision are sensed colors (where the blind cannot exploit the resources the retina provides). We humans use these sensed properties, not the properties of sensory organs (or hands, in the case of the blind), in order to navigate and identify objects. And yet these sensory features – as Descartes says – are features of the mind, not the body. It does seem, then, as if Descartes was launched on the way to producing a mathematical theory of vision. A completed theory could be claimed to actually tell us "what it is like to experience visually as a human being," for it offers as fine a discriminative capacity as is available. Granted, it does not 'give' us what we 'get' when our system is operating and we happen to be looking at a field of flowers. But that is not its job. This has some bearing on the discussion in note 29.

It is not clear why Descartes failed to note that by focusing on formal, mathematical descriptions of operations (as with depth), he had abandoned what he had to say about the body ("movements") and its resources alone, and that he was already offering a computational theory of mind – of how the mind 'computes' the various visual sensations of which it is capable.[34] If he had noted this, he would have had to acknowledge that a science of the relevant brain states and operations – those detailed by the formal mathematical theory of the vision faculty – should not take the form of a description of a hydraulic system with various valves and gatings (what we might now call an "implementational" description), which is how he described neural systems and their operations. That says nothing about what these items 'do' – what they produce or yield to the organism, and how. Rather, it can – and should – be a mathematical description of the operations that these brain states and events carry out and the mental sensory states they can assume, as Newton's inverse square law is a mathematical description of gravitation and the relevant states of the interacting 'bodies' (point masses).

IV Cartesian Linguistics: education and politics

Although not in detail in *CL*, Chomsky does not shy away from pointing to empiricism's implications for human nature, and at the attractions of this conception of human nature to those in power – those in government and (currently) especially those in corporations – and to the many 'managers' (including the majority of intellectuals) who aid those in power.[35] Empiricism commits itself to the idea that central aspects of our minds and cognitive powers – our languages and our concepts – are lodged in a plastic part of the mind/brain. They commit themselves to the idea that much of what makes us human and

distinct from other creatures is due to training and acculturation. Given this, he is blunt: those in positions of power who want to maintain their positions and the authority it gives them – the capacity to make decisions for others, and in doing so to serve their own interests – are attracted to the idea that those over whom they exercise their power are with regard to many of their essential features moldable clay, and must (and should) be molded in their best interests. Not surprisingly, the best interests of those to be molded always seem to turn out to be the interests of those in power. By believing this kind of immoral nonsense and the self-deception it requires, those in power try to justify themselves and their actions, at least to themselves and their friends.

The educational implications of empiricism are obvious: children need and must be given massive amounts of training to ensure that they are put on the 'right' path so that they acquire the 'right' concepts and come to speak the community's language and honor the community's morals and myths. The picture they draw looks very much like indoctrination. And it is not hard to find indoctrination in the state religion – in the US, praise for the wisdom of the 'founding fathers', pledges of allegiance, historical myths designed to evince irrational loyalties and submission, praise for a capitalist market economy, and so on. And there is ample evidence that it is effective, at least by the time a student reaches young adulthood.

But it is also possible in early education to find plentiful evidence that with regard to basic acquisition matters, empiricism is just wrong. The scenario empiricist dogma would have us paint of early child education makes no sense of what actually happens. In the case of language, children in schools (and often before, from parents) do, of course, receive something that looks a bit like empiricist training, and they do need it to function in modern societies. What they need, and hopefully get, is help at advancing "language *skills*," such as reading and writing. Unfortunately for empiricist dogma, though, to develop a child's language skills, s/he must have a language and an ample conceptual store in a mental dictionary already. Plausibly, children have these because they have an innate language faculty that develops automatically, and innate machinery that quickly mobilizes concepts (and linguistic sounds too). Similar points concern moral education. Research shows that children have an innate sense of fairness and of the impermissibility of committing assault. With language they have, then, the resources needed to develop into individuals who can critically assess government performance; Chomsky at the age of ten used such resources to write in his school newspaper of the threat posed by fascism – particularly with regard to Spain.

He used and uses those same resources still. Children in current educational institutions are not encouraged to do anything like that; they are encouraged instead to exercise their innate understanding of human intentions and performance in other areas, in sports (as participants and spectators) and in discussing

the lives and pronouncements of celebrities. These areas of interest – along with video games, and many other forms of 'play' – offer opportunities for marketing, and they serve the interests of power. They can help induce jingoist attitudes; but at the very least, they distract attention.

The educational implications of the RR view of mind are taken up briefly in *CL* in Chomsky's discussion of von Humboldt's work. While children need some help in coming to write and read, and educational institutions should provide this and other skills – such as those of mathematical calculation, and the like – what for the RR view they need most early in life is exposure to a wide range of experiences to give them opportunities to develop individual interests and talents, and encouragement to pursue these interests and talents. To paraphrase Kant and von Humboldt, the only way people can appreciate freedom and creativity is to experience it. Educational institutions should provide the opportunity to do that, even – and perhaps especially – during a child's early years.

Discussing the political implications of the RR view of mind in full is beyond the scope of this introduction. For some details, see (Rai 1995, McGilvray 1999, 2005). Here I will focus on how advances in recent years in Chomsky's RR (now "biolinguistic") science of language supplement the long-standing Enlightenment moral and political view he expresses in *CL*. Like others of or attracted to the Enlightenment, Chomsky aims to base his political views on reason. Unlike earlier figures, his views are enriched by a nascent science of mind in general, and in particular by a developed science of language with a biological foundation. His humanistic principles assume that humans are biological organisms endowed with a special capacity, language, that not only distinguishes humans from other creatures, but that seems to be central to explaining our cognitive creativity and flexibility. The language faculty likely – plausibly along with an innate moral sense that demands universality of application – constitutes what is distinctive about human nature. So as a result of the work of Chomsky and others in recent years, we now have a much better grip on "what makes us human" – on what is distinctive about our natures – than was earlier possible. Earlier, the most favored explanation of our distinctiveness pointed to Reason. Now we can see that reason is common-sensical and scientific – that we can solve problems in these two ways – and that both depend heavily on language. We have a better grip on human nature. And it is obvious that the explanation we can give of what is distinctive about human nature (and how the species came to have such a nature) is within the reach of naturalistic research. There is no reason to appeal to mysterious powers given us by the gods. We are natural objects, as are other creatures, and have what we have as a result of evolution. And having a naturalistic conception of human nature in hand helps makes sense of how one could define an ideal form of social organization, and justify – or criticize – current practices. It provides the social critic with an indispensable tool for proposing reform and redress.

Chomsky thinks of the task of constructing a view of an ideal form of social organization as that of constructing a "vision" (1996), a vision that can be used to justify various projects. The vision he constructs assumes that people have basic needs – not only survival, but those needs that are distinctive to human beings. The latter needs consist of freedom (creativity, autonomy…) and community with choice. These needs, he supposes with reason, are built into our natures as humans. Given the prominence of language in defining our natures and the creativity language enables, creativity/freedom is an obvious choice for someone aiming towards a form of self-fulfillment ethic. It is not difficult to understand too why community-with-choice figures prominently. People need to choose how they work (thereby choosing with whom they are going to cooperate in productive activity), who their friends are, and so on, and they enter such communities as autonomous individuals who maintain their autonomy. That is the need, but of course, the majority of today's workforce does not enjoy that autonomy and cannot satisfy that need. The majority consists of what many in the nineteenth century called "wage slaves." Chomsky's vision of an ideal form of social organization is that of a system that maximizes the satisfactions of the exercise of individual freedom and of association with others in communities. It ends up with what he calls "libertarian socialism" or "anarchosyndicalism." He does not prescribe a specific form of organization. By focusing on fundamental human needs and their maximal satisfaction, he offers a justified strategy for improving. Anarchosyndicalist or libertarian socialist visions offer guidance and a goal that can and no doubt must adapt to specific circumstances to come up with specific policies and proposals. Chomsky notes, for example, that while he is an anarchist, he currently suggests strengthening government control of corporations (Chomsky 1996). Private power is so entrenched at this point that only governments can control them.

Chomsky seems to think that really, everyone has a sense of fundamental human needs. But it is not in the interests of those in power to let it surface, much less play a role in political action. With this in mind, it is significant that Chomsky's political works often focus on simply describing the actions of individuals in positions of power, and the performance of political institutions. His political works aid in a kind of consciousness-raising. The information he details is drawn from the major media, but prominently from other – generally more reliable – sources, including government and academic statistics concerning income levels, budget reports, and reliable alternative sources (NGOs, in-field researchers, etc.). Presenting information that is ignored or heavily massaged by major media and detailing it (in the words of Irene Gendzier [in McGilvray 2005], engaging in "historical retrieval"), he exhibits to any reader or listener not in the grip of a secular religion the failings of individuals in power and the institutions they control. To easily recognize failings from descriptions alone presupposes that people have an idea of what good political institutions should look like – that is, of what they should do.

Political institutions are not natural objects or forces of nature. They are artifacts created by human beings to serve human interests and needs. They are supposed to serve interests and needs, and it does not take much discernment to see that current democracies are "Madisonian," not "Jeffersonian." These honor the view that those who own the country should run it; they serve the interests not of the great majority of the population, but of the managers and those with private power – currently, upper management in corporations, hedge fund players, holders of capital, and the like. Given this, Chomsky and Herman's model of corporate-run media (1978, 1979, 1988; Chomsky 1988b) makes good sense: corporate media personnel ensure that their position is maintained, that no one questions the 'fact' that corporations should control the economy and effectively run the country. Apparently, people easily recognize that current democracies are Madisonian, and not genuine, Jeffersonian democracies; they are oligarchies and plutocracies. And they also know that democratic governments are supposed to serve the needs and interests of all their citizens, not just, or even primarily those of individuals with power. People are aware of those needs, for they have the tools – what Chomsky calls "Cartesian common sense" to be aware of them.

In sum, Chomsky's naturalized science of human nature indicates that human beings are biologically constituted to be creative creatures who also choose to associate with others on conditions of autonomy. This science can, and if one wants to be reasonable, should, help justify a vision of how humans can best live together and meet their needs while doing so. Chomsky's science of human nature can serve as the key to renovating and establishing Enlightenment moral values.

Cartesian Linguistics

A Chapter in the History of Rationalist Thought

Noam Chomsky

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A brief, and sufficiently accurate, description of the intellectual life of the European races during the succeeding two centuries and a quarter up to our own times is that they have been living upon the accumulated capital of ideas provided for them by the genius of the seventeenth century.

A. N. Whitehead, *Science and the Modern World*

Introduction

Whitehead's often quoted remark, cited here, provides a useful background for a discussion of the history of linguistics in the modern period. As applied to the theory of language structure, his assessment is quite correct with regard to the eighteenth and early nineteenth centuries. Modern linguistics, however, has self-consciously dissociated itself from traditional linguistic theory and has attempted to construct a theory of language in an entirely new and independent way. The contributions to linguistic theory of an earlier European tradition have in general been of little interest to professional linguists, who have occupied themselves with quite different topics within an intellectual framework that is not receptive to the problems that gave rise to earlier linguistic study or the insights that it achieved; and these contributions are by now largely unknown or regarded with unconcealed contempt. The few modern studies of the history of linguistics have typically taken the position that "everything before the 19th century, not yet being linguistics, can be dealt with in a few lines."[1] In recent years, there has been a noticeable reawakening of interest in questions that were, in fact, studied in a serious and fruitful way during the seventeenth, eighteenth, and early nineteenth centuries, though rarely since. Furthermore, this return to classical concerns has led to a rediscovery of much that was well understood in this period – what I will call the period of "Cartesian linguistics," for reasons that will be sketched below.

A careful study of the parallels between Cartesian linguistics and certain contemporary developments can be rewarding in many ways. A full account of them would go well beyond the scope of this essay, and any attempt to give such an account would, furthermore, be quite premature, in view of the sorry state of the field of the history of linguistics (itself in part a consequence of the disparagement of earlier work that has marked the modern period). I will limit myself here to something less ambitious, namely, a preliminary and fragmentary sketch of some of the leading ideas of Cartesian linguistics with no explicit analysis of its relation to current work that seeks to clarify and develop these ideas. The reader acquainted with current work in so-called "generative grammar" should have little difficulty in drawing these connections for himself.[2] Questions of current interest will, however, determine the general form of this

sketch; that is, I will make no attempt to characterize Cartesian linguistics as it saw itself,[3] but rather will concentrate on the development of ideas that have re-emerged, quite independently, in current work. My primary aim is simply to bring to the attention of those involved in the study of generative grammar and its implications some of the little-known work which has bearing on their concerns and problems and which often anticipates some of their specific conclusions.

This will be something of a composite portrait. There is no single individual who can be shown, on textual grounds, to have held all the views that will be sketched; perhaps Humboldt, who stands directly in the crosscurrents of rationalist and romanticist thought and whose work is in many ways the culmination as well as the terminal point of these developments, comes closest to this. Furthermore, the aptness of the term "Cartesian linguistics" for these developments in linguistic theory may well be questioned, on several grounds. First, these developments have roots in earlier linguistic work; second, several of the most active contributors to them would surely have regarded themselves as quite antagonistic to Cartesian doctrine (see note 3); third, Descartes himself devoted little attention to language, and his few remarks are subject to various interpretations. Each of these objections has some force. Still, it seems to me that there is, in the period under review here, a coherent and fruitful development of a body of ideas and conclusions regarding the nature of language in association with a certain theory of mind[4] and that this development can be regarded as an outgrowth of the Cartesian revolution. In any event, the aptness of the term is a matter of little interest. The important problem is to determine the exact nature of the "capital of ideas" accumulated in the premodern period, to evaluate the contemporary significance of this contribution, and to find ways to exploit it for advancing the study of language.

Creative aspect of language use

Although Descartes makes only scant reference to language in his writings, certain observations about the nature of language play a significant role in the formulation of his general point of view. In the course of his careful and intensive study of the limits of mechanical explanation, which carried him beyond physics to physiology and psychology, Descartes was able to convince himself that all aspects of animal behavior can be explained on the assumption that an animal is an automaton.[5] In the course of this investigation, he developed an important and influential system of speculative physiology. But he arrived at the conclusion that man has unique abilities that cannot be accounted for on purely mechanistic grounds, although, to a very large extent, a mechanistic explanation can be provided for human bodily function and behavior. The essential difference between man and animal is exhibited most clearly by human language, in particular, by man's ability to form new statements which express new thoughts and which are appropriate to new situations. It is quite easy, in his view, to

> conceive of a machine so constructed so that it utters words, and even words which correspond to bodily actions causing a change in its organs (for instance, if you touch it in one place it asks what you want of it; if you touch it in another place it cries out that you are hurting it, and so on). But it is not conceivable that such a machine should produce different arrangements of words so as to give an appropriately meaningful answer to whatever is said in its presence, as the dullest of men can do. (CSM I, 39)[6]

This ability to use language must not be confused with "natural movements which express passions and which can be imitated by machines as well as by animals." The crucial difference is that automata "could never use words or put together other signs as we do in order to declare our thoughts for others." This is a specific human ability, independent of intelligence. Thus,

> it is quite remarkable that there are no men so dull witted or stupid and this includes even madmen that they are incapable of arranging various words together and forming an utterance from them in order to make their thoughts understood; whereas there is no other animal, however perfect and well endowed it may be, that can do the same. (CSM I, 39 40)

Nor can this distinction between man and animal be based on peripheral physiological differences. Thus Descartes goes on to point out that

this does not happen because they lack the necessary organs, for we see that magpies and parrots can utter words as we do, and yet they cannot speak as we do: that is, they cannot show that they are thinking what they are saying. On the other hand, men born deaf and dumb, and thus deprived of speech organs as much as the beasts, or even more so, normally invent their own signs to make themselves understood by those who, being regularly in their company, have the time to learn their language.

In short, then, man has a species-specific capacity, a unique type of intellectual organization which cannot be attributed to peripheral organs or related to general intelligence[7] and which manifests itself in what we may refer to as the "creative aspect" of ordinary language use – its property being both unbounded in scope and stimulus-free. Thus Descartes maintains that language is available for the free expression of thought or for appropriate response in any new context and is undetermined by any fixed association of utterances to external stimuli or physiological states (identifiable in any noncircular fashion).[8]

Arguing from the presumed impossibility of a mechanistic explanation for the creative aspect of normal use of language, Descartes concludes that in addition to body it is necessary to attribute mind – a substance whose essence is thought – to other humans. From the arguments that he offers for the association of mind to bodies that "bear a resemblance" to his, it seems clear that the postulated substance plays the role of a "creative principle" alongside the "mechanical principle" that accounts for bodily function. Human reason, in fact, "is a universal instrument which can serve for all contingencies," whereas the organs of an animal or machine "have need of some special adaptation for any particular action."[9]

The crucial role of language in Descartes's argument is brought out still more clearly in his subsequent correspondence. In his letter to the Marquis of Newcastle (1646), he asserts that "none of our external actions can show anyone who examines them that our body is not just a self-moving machine, but contains a soul with thoughts – with the exception of spoken words or other signs having reference to particular topics without expressing any passion."[10] The final condition is added to exclude "cries of joy or sadness and the like" as well as "whatever can be taught by training to animals." (CSMK, 303)[11] He goes on, then, to repeat the arguments in the *Discourse on the Method*, emphasizing once again that there is no man so imperfect as not to use language for the expression of his thoughts and no "animal so perfect as to use a sign to make other animals understand something which bore no relation to its passions"; and, once again, pointing to the very perfection of animal instinct as an indication of lack of thought and as a proof that animals are mere automata. In a letter of 1649 to Henry More, he expresses himself in the following terms:

But in my opinion the main reason for holding that animals lack thought is the following. Within a single species some of them are more perfect than others, as humans are too. This can be seen in horses and dogs, some of which learn what they

are taught much better than others; and all animals easily communicate to us, by voice or bodily movement, their natural impulses of anger, fear, hunger and so on. Yet in spite of all these facts, it has never been observed that any brute animal has attained the perfection of using real speech, that is to say, of indicating by word or sign something relating to thought alone and not to natural impulse. Such speech is the only certain sign of thought hidden in a body. All human beings use it, however stupid and insane they may be, even though they may have no tongue and organs of voice; but no animals do. Consequently this can be taken as a real specific difference between humans and animals. (CSMK, 366)[12,13]

In summary, it is the diversity of human behavior, its appropriateness to new situations, and man's capacity to innovate – the creative aspect of language use providing the principal indication of this – that leads Descartes to attribute possession of mind to other humans, since he regards this capacity as beyond the limitations of any imaginable mechanism. Thus a fully adequate psychology requires the postulation of a "creative principle" alongside of the "mechanical principle" that suffices to account for all other aspects of the inanimate and animate world and for a significant range of human actions and "passions" as well.

Descartes's observations on language in relation to the problem of mechanistic explanation were elaborated in an interesting study by Cordemoy.[14] His problem in this study is to determine whether it is necessary to assume the existence of other minds.[15] A great deal of the complexity of human behavior is irrelevant to demonstrating that other persons are not mere automata, since it can be explained on hypothetical physiological terms, in terms of reflex and tropism. Limitations of such explanations are suggested by the fact that "they confidently approach something that will destroy them, and abandon what could save them" (p. 7). This suggests that their actions are governed by a will, like his own. But the best evidence is provided by speech, by

the connection I find among the words I constantly hear them utter …

For although I readily conceive that a mere machine could utter some words, I know at the same time that if there was a particular order among the springs that distribute the wind or open the pipes from which the sounds came then they could never change it; so that as soon as the first sound is heard, those which usually follow it will also necessarily be heard, provided that the machine does not lack wind whereas the words I hear uttered by bodies constructed like mine almost never follow the same sequence.

I observe moreover that these words are the same as those I would use to explain my thoughts to other subjects capable of conceiving them. Finally, the more I attend to the effect produced by my words when I utter them before these bodies, the more it seems they are understood, and the words they utter correspond so perfectly to the sense of my words that there is no reason to doubt that a soul produces in them what my soul produces in me. (pp. 8 10)

In short, Cordemoy is arguing that there can be no mechanistic explanation for the novelty, coherence, and relevance of normal speech. He emphasizes,

however, that care must be exercised in using ability to speak as evidence for the inadequacy of mechanistic explanation. The fact that articulate sounds are produced or that utterances can be imitated in itself proves nothing, as this can be explained in mechanical terms. Nor is it of any relevance that "natural signs" may be produced that express internal states or that specific signs may be produced that are contingent on the presence of external stimuli. It is only the ability to innovate, and to do so in a way which is appropriate to novel situations and which yields coherent discourse, that provides crucial evidence. "To speak is not to repeat the same words that one has heard, but… to utter different words in response to those" (p. 19). To show that other persons are not automata, one must provide evidence that their speech manifests this creative aspect, that it is appropriate to whatever may be said by the "experimenter"; "… if I find, by all the observations I can make, that they use language [*La Parole*] as I do, then I will have an infallible reason to believe that they have a soul as I do" (p. 21). Possible types of experiment are then outlined. For example, one can construct new "conventional signs" [*signes d'institution*]:

> I see that I can agree with others that what ordinarily signifies one thing will signify another, and that this has the result that only those with whom I make this agreement seem to understand what I am thinking. (pp. 22 23)

Similarly, evidence is provided

> when I see that these bodies produce signs that bear no relation to their present state or to their preservation; when I see that these signs match those which I would produce to express my thoughts; when I see that they give me ideas which I did not have previously and which refer to things that I already had in mind; and finally when I see a close correlation between their signs and mine; (pp. 28 29)

or by behavior that indicates "that they intended to deceive me" (pp. 30–31). Under such circumstances, when many experiments of this sort have succeeded, "it will not be reasonable for me to believe that they are not like me" (p. 29).

Throughout, what is stressed is the innovative aspect of intelligent performance. Thus,

> … the new thoughts that come through our conversations with other men are a sure sign to all of us that they have a mind like ours; (p. 185)

> … our whole reason for believing that there are minds united with the bodies of men who speak to us is that they often give us new thoughts that we did not have, or they oblige us to change the thoughts that we did have… (p. 187)

Cordemoy consistently maintains that the "experiments" that reveal the limitations of mechanical explanation are those which involve the use of language – in particular, what we have called its creative aspect. In this, as in his discussion of the acoustic and articulatory basis for language use and the methods of conditioning, association, and reinforcement that may facilitate

acquisition of true language by humans and nonlinguistic functional communication systems by animals, Cordemoy is working completely within the framework of Cartesian assumptions.

For our purposes what is important in this is the emphasis on the creative aspect of language use and on the fundamental distinction between human language and the purely functional and stimulus-bound animal communication systems, rather than the Cartesian attempts to account for human abilities.

It is noteworthy that subsequent discussion rarely attempts to meet the Cartesian arguments regarding the limitations of mechanical explanation. Descartes argued that a "thinking substance" must be postulated to account for the facts that he cites. This proposal is generally countered by the claim that a more complex organization of the body is sufficient to account for human abilities, but no serious attempt is made to show how this might be possible (as Descartes, Cordemoy, and others tried to show how animal behavior and human bodily functions of many kinds can be explained on the basis of assumptions about physical organization). La Mettrie, for example, holds that man is simply the most complex of machines. "He is to the ape and the cleverest of animals what the Huyghen's planetary clock is to one of Julien Leroy's watches" (p. 34; *MaM*, p. 140).[16] There is, in his opinion, no difficulty in accounting for thought on mechanical principles. "I believe thought to be so little incompatible with organised matter, that it seems to be one of its properties, like electricity, motive power, impenetrability, extension, etc." (p. 35; *MaM*, pp. 143–144). There should, furthermore, be no obstacle in principle to teaching an ape to speak. It is only "a defect in the speech organs" that stands in the way, and this can be overcome by proper training (p. 11; *MaM*, p. 100). "I hardly doubt at all that if this animal were perfectly trained, we would succeed in teaching him he might at last be taught to utter sounds and consequently to learn a language. Then he would no longer be a wild man, nor an imperfect man, but a perfect man, a little man of the town" (p. 12; *MaM*, p. 103). Similarly, a talking machine is not beyond imagination. "If it took Vaucanson more artistry to make his flautist than his duck, he would have needed even more to make a speaking machine, which can no longer be considered impossible …" (p. 34; *MaM*, pp. 140–141).

Several years before the publication of *L'Homme Machine*, in a slight and presumably only semi-serious work, Bougeant produced one of the very few attempts to refute explicitly the Cartesian argument that human and animal language differ in a fundamental way,[17] but his supposed counterargument merely reaffirms the Cartesian position regarding human and animal language. He bases his claim that "animals speak and understand each other just as well as we do, and sometimes better" (p. 4) on the grounds that they can be trained to respond to signals, that they exhibit their "various feelings" by external signs, that they can work in cooperation (for example, beavers, to whom he ascribes a

language that has much in common with those "language games" that Wittgenstein regards as "primitive forms" of human language). However, he recognizes that "the language of animals is entirely limited to expressing feelings of their passions, which may all be reduced to a small number" (p. 152). "It is necessary that they always repeat the same expression, and that this repetition last as long as the object occupies their attention" (p. 123). They have no "abstract or metaphysical ideas":

> They have only direct cognitions that are completely limited to the material objects that strike their senses. Man is infinitely superior in his language, as in his ideas, being incapable of expressing himself without composing his speech of proper names and relative terms, which determine its sense and application. (p. 154)

Animals, in effect, have only names for various "passions that they feel" (p. 155). They cannot produce "a phrase which is personalized and composite [*personifiée et composée*] as we do" (p. 156):

> Why has nature given animals the faculty of speech? Solely so they can express to each other their desires and feelings, and thereby satisfy their needs and whatever may be necessary for their preservation. I know that language in general has quite a different objective, which is to express ideas, cognitions, reflections, reasonings. But whatever theory one holds regarding the knowledge of animals … it is certain that nature has endowed them with knowledge only of what is useful to them or necessary for the survival of the species and of individuals consequently, with no abstract ideas, no metaphysical reasoning, no enquiry or curiosity about the objects surrounding them, no knowledge except how to conduct themselves, keep well, avoid whatever may harm them, and acquire goods. Nor has one ever seen them engaged in public discussion, or argument about causes and effects. They know only the life of an animal. (pp. 99 100)

In short, animal "language" remains completely within the bounds of mechanical explanation as this was conceived by Descartes and Cordemoy.

Evidently, neither La Mettrie nor Bougeant comes to grips with the problem raised by Descartes – the problem posed by the creative aspect of language use, by the fact that human language, being free from control by identifiable external stimuli or internal physiological states, can serve as a general instrument of thought and self-expression rather than merely as a communicative device of report, request, or command.[18] Modern attempts to deal with the problem of intelligent behavior are hardly more satisfactory. Ryle, for example, in his critique of "Descartes's myth"[19] simply avoids the issue entirely. He claims that the Cartesians should have been "asking by what criteria intelligent behavior is actually distinguished from non-intelligent behavior" (p. 21) rather than seeking an explanation for the former. Properly understood, these are not mutually exclusive alternatives. The criteria that Ryle discusses differ little, in principle, from Cordemoy's proposed "experiments"; but whereas Ryle is content simply to cite the fact that "intelligent behavior" has certain

properties,[20] the Cartesians were concerned with the problem of accounting for such behavior in the face of their inability to provide an explanation in mechanical terms. It can hardly be claimed that we have advanced significantly beyond the seventeenth century in determining the characteristics of intelligent behavior, the means by which it is acquired, the principles that govern it, or the nature of the structures that underlie it. One may choose to ignore these problems, but no coherent argument has been offered that suggests that they are either unreal or beyond investigation.

Modern linguistics has also failed to deal with the Cartesian observations regarding human language in any serious way. Bloomfield, for example, observes that in a natural language "the possibilities of combination are practically infinite," so that there is no hope of accounting for language use on the basis of repetition or listing, but he has nothing further to say about the problem beyond the remark that the speaker utters new forms "*on the analogy* of similar forms which he has heard."[21] Similarly, Hockett attributes innovation completely to "analogy."[22] Similar remarks can be found in Paul, Saussure, Jespersen, and many others. To attribute the creative aspect of language use to "analogy" or "grammatical patterns" is to use these terms in a completely metaphorical way, with no clear sense and with no relation to the technical usage of linguistic theory. It is no less empty than Ryle's description of intelligent behavior as an exercise of "powers" and "dispositions" of some mysterious sort, or the attempt to account for the normal, creative use of language in terms of "generalization" or "habit" or "conditioning." A description in these terms is incorrect if the terms have anything like their technical meanings, and highly misleading otherwise, in so far as it suggests that the capacities in question can somehow be accounted for as just a "more complicated case" of something reasonably well understood.

We have seen that the Cartesian view, as expressed by Descartes and Cordemoy as well as by such professed anti-Cartesians as Bougeant, is that in its normal use, human language is free from stimulus control and does not serve a merely communicative function, but is rather an instrument for the free expression of thought and for appropriate response to new situations.[23] These observations concerning what we have been calling the creative aspect of language use are elaborated in several ways in the eighteenth and early nineteenth centuries, as we shall see directly. At the same time, Descartes's second test for determining whether automata are "real men" is also reinterpreted, within the context of the "great chain of being." Descartes makes a sharp distinction between man and animal, arguing that animal behavior is a matter of instinct and that the perfection and specificity of animal instinct make it subject to mechanical explanation. A characteristic subsequent view is that there is a gradation of intelligence and that perfection of instinct varies inversely with intellectual ability. To La Mettrie, for example, it seems to be a universal

law of nature "that the more one gains in intelligence [*du côté de l'esprit*], the more one loses in instinct" (p. 99). (Cf. notes 7, 29.)

The two Cartesian tests (possession of language, diversity of action) are interrelated by Herder, in an original way, in his influential Prize Essay on the origin of language.[24] Like Descartes, Herder argues that human language is different in kind from exclamations of passion and that it cannot be attributed to superior organs of articulation, nor, obviously, can it have its origins in imitation of nature or in an "agreement" to form language.[25] Rather, language is a natural property of the human mind. But nature does not provide man with an instinctive language, or an instinctive faculty of language, or a faculty of reason of which language is a "reflection." Man's fundamental quality is, rather, weakness of instinct, and man is clearly far inferior to animals in strength and certainty of instinct. But instinct and refinement of sense and skill correlate with narrowness of the scope and sphere of life and experience, with the focusing of all sensitivity and all power of representation on a narrow fixed area (pp. 15–16). The following can be taken as a general principle: "the sensitivity, capability, and productive drive of animals increase in power and intensity in inverse proportion to the magnitude and diversity of their sphere of activity" (pp. 16–17). But man's faculties are less acute, more varied and more diffuse. "Man does not have an unvaried and narrow sphere of activity, where only one task awaits him" (p. 17). He is not, in other words, under the control of external stimuli and internal drives and compelled to respond in a perfect and specific way. This freedom from instinct and from stimulus control is the basis for what we call "human reason": "… if man had the drives of animals, he could not have in him what we now call reason, since such drives would unknowingly pull his forces towards a single point, so that he would have no free sphere of awareness" (p. 22). It is this very weakness of instinct that is man's natural advantage, that makes him a rational being. "If man cannot be an instinctive animal, he must – enabled by the freely working positive power of his soul – become a reflective creature" (p. 22). In compensation for his weakness of instinct and sense, man receives the "advantage of freedom" (p. 20). "No longer inevitably a machine in the hands of nature, he himself becomes the purpose and the objective of his efforts" (p. 20).

Free to reflect and to contemplate, man is able to observe, compare, distinguish essential properties, identify, and name (pp. 23f.). It is in this sense that language (and the discovery of language) is natural to man (p. 23), that "the human being is formed to be a creature of language" (p. 43). On the one hand, Herder observes that man has no innate language – man does not speak by nature. On the other hand, language in his view is so specifically a product of man's particular intellectual organization that he is able to claim: "If I were to gather up all the loose ends and display that fabric called human nature: definitely a linguistic weave!" The resolution of the apparent paradox lies in

his attempt to account for human language as a consequence of the weakness of human instinct.

Descartes had described human reason as "a universal instrument which can be used in all kinds of situations"[26] and which therefore provides for unbounded diversity of free thought and action.[27] Herder does not regard reason as a "faculty of the mind" at all but defines it rather as the freedom from stimulus control, and he attempts to show how this "natural advantage" makes it possible – in fact, necessary (p. 25) – for humans to develop language.

Somewhat before Herder, James Harris had given a characterization of "rationality" in terms rather similar to his, that is, as freedom from instinct rather than as a faculty with fixed properties. Harris distinguishes between the "*Human* Principle," which he calls "reason," and the "*Brutal* Principle," which he calls "instinct," in the following passage:

> MARK then … the Difference between *Human* Powers and *Brutal* The Leading Principle of BRUTES appears to tend in each Species to *one single* Purpose to this, in general, it *uniformly arrives*; and here, in general, it as *uniformly stops* it needs no Precepts or Discipline to instruct it; nor will it easily be *changed*, or *admit a different Direction*. On the contrary, the Leading Principle of MAN is capable of *infinite* Directions is convertible to *all sorts of Purposes* equal to *all sorts of Subjects* neglected, remains ignorant, and void of every Perfection cultivated, becomes adorned with Sciences, and Arts can raise us to excel, not only *Brutes*, but *our own Kind* with respect to our *other* Powers and Faculties, can instruct us how to *use* them, as well as *those* of the various *Natures*, which we see existing around us. In a word, to oppose the two Principles to each other The Leading Principle of *Man*, is *Multiform, Originally Uninstructed, Pliant* and *Docil* The Leading Principle *of Brutes* is *Uniform, Originally Instructed*; but, in most Instances afterward, *Inflexible* and *Indocil*.[28]

Thus we may say "that MAN is by Nature a RATIONAL ANIMAL," meaning by this nothing more than that he is free from the domination of instinct.[29]

A concern for the creative aspect of language use persists through the romantic period, in relation to the general problem of true creativity, in the full sense of this term.[30] A. W. Schlegel's remarks on language in his *Kunstlehre*[31] give a characteristic expression to these developments. In discussing the nature of language, he begins by observing that speech does not relate merely to external stimuli or goals. The words of language, for example, may arouse in the speaker and hearer ideas [*Vorstellungen*] of things that they have not directly perceived but know only by verbal description or that they "aren't able to intuit sensuously at all because they exist in an intellectual [*geistigen*] world." Words may also designate abstracted properties and relations of the speaker to the hearer and to the topic of discourse, and relations among the elements of the latter. In combining our "thoughts and ideas" we use "words with such subtle meanings that to clarify them would disconcert a philosopher." Still, they are used freely by the uninstructed and the unintelligent:

> We fit all these words together in ways that allow others to not merely understand our purpose but glimpse our innermost feelings; in this way we excite the most diverse passions, affirm or negate moral decisions, and incite a crowd to collective action. The greatest things as well as the least significant, the greatest marvel never before heard indeed the most impossible and unthinkable things slide off our tongues with equal ease.

So characteristic of language is this freedom from external control or practical end, for Schlegel, that he elsewhere[32] proposes that "anything by means of which the inner manifests itself outwardly is rightly called language."

From this conception of language, it is only a short step to the association of the creative aspect of language use with true artistic creativity.[33] Echoing Rousseau and Herder, Schlegel describes language as "the most marvelous creation of the poetic faculty of the human being" (*Sprache und Poetik*, p. 145). Language is "an ever-becoming, self transforming, unending poem of the entire human race" (*Kunstlehre*, p. 226). This poetic quality is characteristic of the ordinary use of language, which "can never be so completely depoetized that it should find itself scattered into an abundance of poetical elements, even in the case of the most calculating and rational use of linguistic signs, all the more so in the case of everyday life – in impetuous, immediate, often passionate colloquial language" (ibid., p. 228). There would have been little difficulty, he continues, in demonstrating to Molière's M. Jourdain that he spoke poetry as well as prose.

The "poetical" quality of ordinary language derives from its independence of immediate stimulation (of "the physically perceivable universe") and its freedom from practical ends. These characteristics, along with the boundlessness of language as an instrument of free self-expression, are essentially those emphasized by Descartes and his followers. But it is interesting to trace, in slightly greater detail, the argument by which Schlegel goes on to relate what we have called the creative aspect of language use to true creativity. Art, like language, is unbounded in its expressive potentiality.[34] But, Schlegel argues, poetry has a unique status among the arts in this respect; it, in a sense, underlies all the others and stands as the fundamental and typical art form. We recognize this unique status when we use the term "poetical" to refer to the quality of true imaginative creation in any of the arts. The explanation for the central position of poetry lies in its association with language. Poetry is unique in that its very medium is unbounded and free; that is, its medium, language, is a system with unbounded innovative potentialities for the formation and expression of ideas. The production of any work of art is preceded by a creative mental act for which the means are provided by language. Thus the creative use of language, which, under certain conditions of form and organization, constitutes poetry (cf. p. 231), accompanies and underlies any act of the creative imagination, no matter what the medium in which it is realized. In this way, poetry achieves its unique status

among the arts, and artistic creativity is related to the creative aspect of language use.[35] (Compare Huarte's third kind of wit – see note 9.)

Schlegel distinguishes human from animal language in the typical Cartesian manner. Thus he observes that one cannot attribute man's linguistic ability to the "natural disposition of his organs":

> Various species share to a certain extent with human beings the ability, although totally mechanical, to learn language. By means of training and frequent repetition a stimulus towards certain reactions is brought about in their organs, but they never use the words they learned autonomously (even though it might seem so), in order to designate, and their speech is just as little an authentic language as the sounds produced by a speaking machine. (p. 236)

We cannot draw analogies between human and animal intellectual function. Animals live in a world of "states of affairs" [*Zustände*] not of "objects" [*Gegenstände*] in the human sense (the same is true, in part, of young children, which accounts for the confused and incoherent character of even the liveliest childhood memories). The "animal dependency" [*tierische Abhängigkeit*] is, for Schlegel, sharply opposed to the "spontaneous principle" [*selbsttätige Prinzip*] of "rational volition" [*verständige Willkür*] that characterizes human mental life. It is this principle that provides the basis for human language. It leads to a search for coherence and unity in experience, to comparison of sensible impressions (which requires mental signs, of some sort), and to the unique human capacity and need "through language to want to refer to even those things that cannot be given in any sensuous intuition." What results is a human language, which serves primarily "as the organ of thought, as a means of reflection" and only derivatively for the purposes of "social communication" (pp. 237–241).

The Cartesian emphasis on the creative aspect of language use, as the essential and defining characteristic of human language, finds its most forceful expression in Humboldt's attempt to develop a comprehensive theory of general linguistics.[36] Humboldt's characterization of language as *energeia* ("activity" [*Thätigkeit*]) rather than *ergon* ("product" [*Werk*]),[37] as "a generative activity [*eine Erzeugung*]" rather than "a lifeless product" [*ein todtes Erzeugtes*] extends and elaborates – often, in almost the same words – the formulations typical of Cartesian linguistics and romantic philosophy of language and aesthetic theory. For Humboldt, the only true definition of language is "a productive activity" [*eine genetische*]: "It is the ever repeated *mental labour* [*Arbeit des Geistes*] of making *articulated sound* capable of expressing *thought* (p. 57). [38] There is a constant and uniform factor underlying this "mental labour"; it is this which Humboldt calls the "Form" of language.[39] It is only the underlying laws of generation that are fixed, in language. The scope and manner in which the generative process may operate in the actual production of speech (or in speech perception, which Humboldt regards as a partially analogous performance – see pp. 105–106 below) are totally undetermined. (See note 38.)

The concept of Form includes the "rules of speech articulation" [*Redefügung*] as well as the rules of "word formation" [*Wortbildung*] and the rules of formation of concepts that determine the class of "root words" [*Grundwörter*] (p. 61). In contrast, the substance [*Stoff*] of language is unarticulated sound and "the totality of sense-impressions and spontaneous mental activities that precede the creation of the concept with the aid of language" (p. 61). The Form of language is a systematic structure. It contains no individual elements as isolated components but incorporates them only in so far as "a method of language formation" can be discovered in them (p. 62).

The fixed mechanisms that, in their systematic and unified representation, constitute the form of the language must enable it to produce an indefinite range of speech events corresponding to the conditions imposed by thought processes. The domain of language is infinite and boundless, "the essence of all that can be thought" (p. 122). Consequently, the fundamental property of a language must be its capacity to use its finitely specifiable mechanisms for an unbounded and unpredictable set of contingencies. "It must therefore make infinite use of finite means, and is able to do so through the productive power that is the identity of language and thought" (p. 122).

Not even the lexicon of a language can, according to Humboldt, be regarded as an "inert completed mass." Even apart from the formation of new words, the use of the lexicon by the speaker or the hearer involves "a continuous generation and regeneration of the word-making capacity" (pp. 125–126). This is true of the original formation of the language and its acquisition by children, and it is also true of the daily use of speech (cf. note 25). He thus regards the lexicon, not as a memorized list from which words are simply extracted as language is used ("No human memory would be equal to this, if the soul did not simultaneously carry by instinct within itself the key to the formation of the words themselves"), but rather as based on certain organizing generative principles that produce the appropriate items on given occasions. It is from such an assumption that he develops his well-known view that (in modern terms) concepts are organized in terms of certain "semantic fields" and that they receive their "value" in terms of their relation to the principles that determine this system.

Speech is an instrument of thought and self-expression. It plays an "immanent" and "constitutive" role in determining the nature of man's cognitive processes, his "thinking and, through thought, creative power" [*denkende und im Denken schöpferische Kraft*] (p. 36), his "world view" and processes of "tying together thoughts" [*Gedankenverknüpfung*] (p. 50). More generally, a human language as an organized totality is interposed between man and "the nature that affects him, both inwardly and outwardly" (p. 74). Although languages have universal properties, attributable to human mentality as such, nevertheless each language provides a "thought world" and a point of view of a unique sort. In attributing such a role in the determination of mental processes

to individual languages, Humboldt departs radically from the framework of Cartesian linguistics, of course, and adopts a point of view that is more typically romantic.

Humboldt does remain within the Cartesian framework, however, in so far as he regards language primarily as a means of thought and self-expression rather than as an animal-like functional communication system – when he maintains, for example, that man "surrounds himself with a world of sounds, so as to take up and process within himself the world of objects" (p. 74). Thus even in its beginnings, "language … is extended unthinkingly to all objects of casual sense perception and inner concern" (p. 75; Humboldt 1999: 60). He regards it as a mistake to attribute language primarily to the need for mutual assistance. "Man is not so needy – and inarticulate sounds would suffice for the rendering of assistance." There are, to be sure, purely practical uses of language, as, for example, if a man orders a tree to be felled and "thinks of nothing by that term but the trunk that he designates" (p. 220). The same words might, however, have an "enhanced significance" if they were used in a description of nature or in a poem, for example, in which case the words are not used simply as instruments or with a purely referential function, are not used "in a *localized activity of the soul* for a limited *purpose*" but are rather referred to "the inner whole of thought-association and feeling" (p. 221; Humboldt 1999: 156). It is only in the latter case that the full resources of language are used in forming or interpreting speech, that all aspects of the lexical and grammatical structure of an utterance make their full contribution to its interpretation. The purely practical use of language is characteristic of no real human language, but only of invented parasitic systems.[40]

In developing the notion of "form of language" as a generative principle, fixed and unchanging, determining the scope and providing the means for the unbounded set of individual "creative" acts that constitute normal language use, Humboldt makes an original and significant contribution to linguistic theory – a contribution that unfortunately remained unrecognized and unexploited until fairly recently.[41] The nature of Humboldt's contribution can be appreciated by comparing his notion of "form" to that developed in Harris's *Hermes* (1751), for example. For Harris, a language is essentially a system of words. Their meanings (the ideas of which they are the symbols) constitute the form of language; their sound, its matter (substance). Harris's notion of form is modeled on a classical pattern, the underlying conception being that of shape or orderly arrangement. But in his work on language, Harris does not suggest that a description of its form requires more than a specification of elements, categories, and the association of "content elements" to "expression elements." He does not, in other words, give any indication of grasping Humboldt's insight that language is far more than "patterned organization" of elements of various types and that any adequate description of it must refer these elements to the

finite system of generative principles which determine the individual linguistic elements and their interrelations and which underlie the infinite variety of linguistic acts that can be meaningfully performed.[42]

The development of Humboldt's notion of "form of language" must be considered against the background of the intensive discussion during the romantic period of the distinction between "mechanical form" and "organic form." A. W. Schlegel makes the distinction in the following way:

> Form is mechanical when, through external force, it is imparted to any material merely as an accidental addition without reference to its quality; as, for example, when we give a particular shape to a soft mass that it may retain the same after its induration. Organical form, again, is innate; it unfolds itself from within, acquires its determination contem poraneously with the perfect development of the germ.[43]

In Coleridge's paraphrase:

> The form is mechanic, when on any given material we impress a predetermined form, not necessarily arising out of the properties of the material; as when to a mass of wet clay we give whatever shape we wish it to retain when hardened. The organic form, on the other hand, is innate; it shapes, as it develops, itself from within, and the fulness of its development is one and the same with the perfection of its outward form. Such as the life is, such is the form. Nature, the prime genial artist, inexhaustible in diverse powers, is equally inexhaustible in forms, each exterior is the physiognomy of the being within, its true image reflected and thrown out from the concave mirror…[44]

The context, in both cases, is an investigation of how individual works of genius are constrained by rule and law. Humboldt's concept of the "organic form" of language, and its role in determining the individual creations of speech, is a natural by-product of the discussion of organic and mechanical form, particularly in the light of the connection that had already been drawn between artistic creativity and the creative aspect of language use (cf. pp. 61–62, above).[45]

The parallel between Humboldt's notion of "organic form" in language and Goethe's much earlier theory of "Urform" in biology[46] is also quite striking. The concept of "Urform" was intended as a new dimension beyond the "static" concept of form of Linneaus and Cuvier, for example (namely, the concept of form as structure and organization). But, at least at one stage of his thought, Goethe took this dimension to be one of logical rather than temporal order. In a letter to Herder, in 1787, Goethe writes:

> The primordial plant is the most marvelous created thing in the world, and nature herself should envy me it. With this model and its key one is able thereby to invent other plants *ad infinitum*, which must be consistent with the model. That is, even if these invented plants do not exist, they *could* exist. They are not, for example, pictorial or poetic shadows and illusions; they rather have an inner truth and necessity. The same law applies to all other living beings.[47]

Thus, the Urform is a kind of generative principle that determines the class of physically possible organisms; and, in elaborating this notion, Goethe tried to

formulate principles of coherence and unity which characterize this class and which can be identified as a constant and unvarying factor beneath all the superficial modifications determined by variation in environmental conditions. (Cf. Magnus, op. cit., chap. 7, for some relevant material.) In a similar way, Humboldt's "linguistic form" constrains all individual acts of speech production or perception in a particular language, and, more generally, the universal aspects of grammatical form determine the class of possible languages.[48]

Finally, we should note that Humboldt's conception of language must be considered against the background provided by his writings on social and political theory[49] and the concept of human nature that underlies them. Humboldt has been described as "the most prominent representative in Germany" of the doctrine of natural rights and of the opposition to the authoritarian state.[50] His denunciation of excessive state power (and of any sort of dogmatic faith) is based on his advocacy of the fundamental human right to develop a personal individuality through meaningful creative work and unconstrained thought:

> Naturally, freedom is the necessary condition without which even the most soul satisfying occupation cannot produce any wholesome effects of this sort. Whatever task is not chosen of man's free will, whatever constrains or even only guides him, does not become part of his nature. It remains forever alien to him; if he performs it, he does so not with true humane energy but with mere mechanical skill. (Cowan, op. cit., pp. 46 47)

> [Under the condition of freedom from external control] … all peasants and craftsmen could be transformed into *artists*, i.e., people who love their craft for its own sake, who refine it with their self guided energy and inventiveness, and who in so doing cultivate their own intellectual energies, ennoble their character, and increase their enjoyments. This way humanity would be ennobled by the very things which now, however beautiful they might be, degrade it. (ibid., p. 45)

The urge for self-realization is man's basic human need (as distinct from his merely animal needs). One who fails to recognize this "ought justly to be suspected of failing to recognize human nature for what it is and of wishing to turn men into machines" (ibid., p. 42). But state control is incompatible with this human need. It is fundamentally coercive, and therefore "it produces monotony and uniformity, and alienates people's actions from their own character" (ibid., p. 41: "so bringt er Einformigkeit und eine fremde Handlungsweise."). This is why "true reason cannot desire for man any condition other than that in which … every individual enjoys the most absolute, unbounded freedom to develop himself out of himself, in true individuality" (ibid., p. 39). On the same grounds, he points to the "pernicious results of limitations upon freedom of thought" and "the harm done if the government takes a positive promoting hand in the business of religious worship" (ibid., pp. 30–31), or if it interferes in higher education (ibid., pp. 133f.), or if it regulates personal relations of any sort

(e.g., marriage; ibid., p. 50), and so on. Furthermore, the rights in question are intrinsically human and are not to be limited to "the few in any nation"; "there is something utterly degrading to humanity in the very thought that some human being's right to be human could be abrogated" (ibid., p. 33). To determine whether the fundamental human rights are being honored, we must consider, not just what a person does, but the conditions under which he does it – whether it is done under external control or spontaneously, to fulfill an inner need. If a man acts in a purely mechanical way, "we may admire what he does, but we despise what he is" (ibid., p. 37).[51]

It is clear, then, that Humboldt's emphasis on the spontaneous and creative aspects of language use derives from a much more general concept of "human nature," a concept which he did not originate but which he developed and elaborated in original and important ways.

As remarked above, Humboldt's effort to reveal the organic form of language – the generative system of rules and principles that determines each of its isolated elements – had little impact on modern linguistics, with one significant exception. The structuralist emphasis on language as "a system where everything holds together" is conceptually, at least, a direct outgrowth of the concern for organic form in Humboldtian linguistics. For Humboldt, a language is not to be regarded as a mass of isolated phenomena – words, sounds, individual speech productions, etc. – but rather as an "organism" in which all parts are interconnected and the role of each element is determined by its relation to the generative processes that constitute the underlying form. In modern linguistics, with its almost exclusive restriction of attention to inventories of elements and fixed "patterns" the scope of "organic form" is far more narrow than in the Humboldtian conception. But within this more narrow frame, the notion of "organic interconnection" was developed and applied to linguistic materials in a way that goes far beyond anything suggested in Humboldt. For modern structuralism, the dominant assumption is that "a phonological system [in particular] is not the mechanical sum of isolated phonemes, but an organic whole of which the phonemes are the members and of which the structure is subject to laws."[52] These further developments are familiar, and I will say nothing more about them here.

As noted above, the form of language, for Humboldt, embraces the rules of syntax and word formation as well as the sound system and the rules that determine the system of concepts that constitute the lexicon. He introduces a further distinction between the form of a language and what he calls its "character." It seems to me that, as he employs this term, the character of a language is determined by the manner in which it is used, in particular, in poetry and philosophy; and the "inner character" (p. 208) of a language must be distinguished from its syntactic and semantic structure, which are matters of form, not use. "Without changing the language in its sounds, and still less in its

forms and laws, *time*, through a growing evolution of ideas, a heightened power of thought, and a more deeply penetrating capacity for feeling, will often bring into a language what it did not formerly possess" (p. 116; Humboldt 1999: 86–7). Thus a great writer or thinker can modify the character of the language and enrich its means of expression without affecting its grammatical structure. The character of a language is closely related to other elements of the national character and is a highly individual creation. For Humboldt, as for his Cartesian and romantic precursors, the normal use of language typically involves creative mental acts; but it is the character of a language rather than its form that reflects true "creativity" in a higher sense – in the sense that implies value as well as novelty.

For all his concern with the creative aspect of language use and with form as generative process, Humboldt does not go on to face the substantive question: what is the precise character of "organic form" in language. He does not, so far as I can see, attempt to construct particular generative grammars or to determine the general character of any such system, the universal schema to which any particular grammar conforms. In this respect, his work in general linguistics does not reach the levels achieved by some of his predecessors, as we shall see directly. His work is also marred by unclarity regarding several fundamental questions, in particular, regarding the distinction between the rule-governed creativity which constitutes the normal use of language and which does not modify the form of the language at all and the kind of innovation that leads to a modification in the grammatical structure of the language. These defects have been recognized and, to some extent, overcome in more recent work. Furthermore, in his discussion of generative processes in language it is often unclear whether what he has in mind is underlying competence or performance – Aristotle's first or second grade of actuality of form (*De Anima*, book II, chap. 1). This classical distinction has been reemphasized in modern work. See note 2, and references given there. The concept of generative grammar, in the modern sense, is a development of the Humboldtian notion of "form of language" only if the latter is understood as form in the sense of "possession of knowledge" rather than "actual exercise of knowledge," in Aristotelian terms. (See note 39.)

It should, incidentally, be noted that the failure to formulate rules of sentence construction in a precise way was not simply an oversight of Cartesian linguistics. To some extent it was a consequence of the express assumption that the sequence of words in a sentence corresponds directly to the flow of thought, at least in a "well-designed" language,[53] and is therefore not properly studied as part of grammar. In the *Grammaire générale et raisonnée* it is maintained that, except for the figurative use of language, there is little to be said in grammar regarding rules of sentence construction (p. 145). In Lamy's rhetoric, shortly after, omission of any discussion of "the order of words and the rules that must be observed in the composition of speech" is justified on the grounds that "the

natural light shows so vividly what must be done" that no further specification is necessary (p. 25).[54] At about the same time, Bishop Wilkins[55] distinguishes those constructions that are merely "customary" (*take one's heels and fly away, hedge a debt, be brought to heel*, etc.) from those which follow the "natural sense and order of the words" and therefore need no special discussion (p. 354); for example, the arrangement of Subject, Verb, and Object, or Subject, Copula, and Adjective, or the ordering of "grammatical" and "transcendental" particles relative to the items they govern, etc. (p. 354).

At the opposite pole from the belief in "natural order" is the view that each language contains an arbitrary collection of "patterns" learned through constant repetition (and "generalization") and forming a set of "verbal habits" or "dispositions." The belief that language structure and language use can somehow be described in these terms underlies much of the modern study of language and verbal behavior, often coupled with a denial of the possibility of useful cross-linguistic generalizations in syntax (see pp. 57–58, above). Like the reliance on a presumed natural order, it has helped foster a neglect of the problem of specifying the "grammatical form" of particular languages or the general abstract schema to which each language must conform.[56]

In summary, one fundamental contribution of what we have been calling "Cartesian linguistics" is the observation that human language, in its normal use, is free from the control of independently identifiable external stimuli or internal states and is not restricted to any practical communicative function, in contrast, for example, to the pseudo language of animals. It is thus free to serve as an instrument of free thought and self-expression. The limitless possibilities of thought and imagination are reflected in the creative aspect of language use. Language provides finite means but infinite possibilities of expression constrained only by rules of concept formation and sentence formation, these being in part particular and idiosyncratic but in part universal, a common human endowment. The finitely specifiable form of each language – in modern terms, its generative grammar (cf. note 39) – provides an "organic unity" interrelating its basic elements and underlying each of its individual manifestations, which are potentially infinite in number.

The dominant view throughout this period is that "languages are the best mirror of the human mind."[57] This virtual identification of linguistic and mental processes is what motivates the Cartesian test for the existence of other minds, discussed above. It finds expression throughout the romantic period. For Friedrich Schlegel, "Mind and language are so inseparable, thought and word are so essentially one, that, just as certainly as thoughts are considered to be the characteristic privilege of humankind, we can call the word, in accordance with its inner meaning and dignity, the original essence of man."[58] We have already made reference to Humboldt's conclusion that the force that generates language is indistinguishable from that which generates thought. Echoes of this

conclusion persist for some time,[59] but they become less frequent as we enter the modern period.

The association of language and mind, it should be noted, is regarded rather differently in the earlier and later phases of the period under review. The earlier view is that the structure of language reflects the nature of thought so closely that "the science of language differs hardly at all from that of thought" (Beauzée, p. x)[60]; the creative aspect of language use is accounted for on the basis of this assumption.[61] On the other hand, the observation that language serves as a medium of thought begins to be rephrased as the view that language has a constitutive function with respect to thought. La Mettrie, for example, in discussing how the brain compares and relates the images that it discerns, concludes that its structure is such that, once the signs of objects and their differences "have been traced or imprinted on the brain, the soul necessarily examines their relations[62] – an examination that would have been impossible without the discovery of signs or the invention of language" (op. cit., p. 105); prior to the discovery of language, things could only be perceived in a vague or superficial way. We have already referred to Humboldt's view that "Man lives primarily with objects, indeed, since feeling and acting in him depend on his presentations [*Vorstellungen*], he actually does so exclusively, as language presents them to him" (op. cit., p. 74; Humboldt 1999: 60). Under the impact of the new relativism of the romantics, the conception of language as a constitutive medium for thought undergoes a significant modification, and the notion that language difference can lead to differences, even incomparability in mental processes, is explored.[63] This development, however, is not part of our main theme; its modern elaboration is familiar, and I will discuss it no further here.

Deep and surface structure

We have observed that the study of the creative aspect of language use develops from the assumption that linguistic and mental processes are virtually identical, language providing the primary means for free expression of thought and feeling, as well as for the functioning of the creative imagination. Similarly, much of the substantive discussion of grammar, throughout the development of what we have been calling "Cartesian linguistics," derives from this assumption. The Port-Royal *Grammar*, for example, begins the discussion of syntax with the observation that there are "three operations of our minds: *conceiving, judging*, and *reasoning*" (p. 27), of which the third is irrelevant to grammar (it is taken up in the Port-Royal *Logic*, which appeared two years later, in 1662). From the manner in which concepts are combined in judgments, the *Grammar* deduces what it takes to be the general form of any possible grammar, and it proceeds to elaborate this universal underlying structure from a consideration of "the natural manner in which we express our thoughts" (p. 30).[64] Most subsequent attempts to develop a schema of universal grammar proceed along the same lines.

James Harris's *Hermes*, which does not bear the imprint of the Port-Royal *Grammar* to the extent usual in eighteenth-century work, also reasons from the structure of mental processes to the structure of language, but in a somewhat different way. In general, he maintains, when a man speaks, "his Speech or Discourse is *a publishing of some Energie or Motion of his soul"* (p. 223).[65] The "powers of the soul" are of two general types: perception (involving the senses and the intellect) and volition (the will, passions, appetites –" all that moves to Action whether rational or irrational" (p. 224). It follows that there are two kinds of linguistic acts: to assert, that is, "to publish some Perception either of the Senses or the Intellect"; or to "publish volitions," that is, to interrogate, command, pray, or wish (p. 224). The first type of sentence serves "to declare ourselves to others"; the second, to induce others to fulfill a need. Continuing in this way, we can analyze the volitional sentences in terms of whether the need is "to have some perception informed" or "some volition gratified" (the interrogative and requisitive modes, respectively); the requisitive is further analyzed as imperative or precative, depending on whether the sentence is addressed to

inferiors or non-inferiors). Since both interrogatives and requisitives serve "to answer to a need," both types "require a return" – a return in words or deeds, to the requisitive, and in words alone, to the interrogative (p. 293f.).[66] Thus the framework for the analysis of types of sentences is provided by a certain analysis of mental processes.

Pursuing the fundamental distinction between body and mind, Cartesian linguistics characteristically assumes that language has two aspects. In particular, one may study a linguistic sign from the point of view of the sounds that constitute it and the characters that represent these signs or from the point of view of their "signification," that is, "the manner in which men use them for signifying their thoughts" (Port-Royal *Grammar*, p. 41). Cordemoy announces his goal in similar terms: "in this discourse I make a precise survey of everything that speech [*la Parole*] derives from the soul and everything it borrows from the body" (*Discours physique de la parole*, Preface). Similarly, Lamy begins his rhetoric by distinguishing between "the soul of words" (that is, "their mental [*spiritual*] aspect," "what is particular to us" – the capacity of expressing "our ideas") from "their body" – "their corporeal aspect," "what the birds that imitate the voices of men have in common with us," namely, "the sounds, which are signs of their ideas" (*De L'art de parler*).

In short, language has an inner and an outer aspect. A sentence can be studied from the point of view of how it expresses a thought or from the point of view of its physical shape, that is, from the point of view of either semantic interpretation or phonetic interpretation.

Using some recent terminology, we can distinguish the "deep structure" of a sentence from its "surface structure." The former is the underlying abstract structure that determines its semantic interpretation; the latter, the superficial organization of units which determines the phonetic interpretation and which relates to the physical form of the actual utterance, to its perceived or intended form. In these terms, we can formulate a second fundamental conclusion of Cartesian linguistics, namely, that deep and surface structures need not be identical. The underlying organization of a sentence relevant to semantic interpretation is not necessarily revealed by the actual arrangement and phrasing of its given components.

This point is brought out with particular clarity in the Port-Royal *Grammar*, in which a Cartesian approach to language is developed for the first time, with considerable insight and subtlety.[67] The principal form of thought (but not the only one – cf. p. 79 below) is the judgment, in which something is affirmed of something else. Its linguistic expression is the proposition, the two terms of which are the "subject, which is that of which one affirms" and the "predicate, which is that which is predicated" (p. 29; PRG 67). The subject and the attribute may be *simple*, as in "Earth is round", or *complex* [*composé*], as in "An able magistrate is a man useful to the republic" or "Invisible God created the visible world." Furthermore, in such cases as these, the propositions

contain, at least in our mind, several judgments, from which one can make as many propositions. Thus, for example, when I say "Invisible God created the visible world" three judgments that pass through my mind are included in this proposition. For I judge:
(1) that God is invisible;
(2) that He created the world;
(3) that the world is visible;
and of these three propositions, the second is the principal and essential one of the original proposition. But the first and the third are only subordinate, and comprise only part of the principal proposition the first composing its subject, the third its predicate. (p. 68; PRG 99 100)

In other words, the deep structure underlying the proposition "Invisible God created the visible world" consists of three abstract propositions, each expressing a certain simple judgment, although its surface form expresses only the subject-attribute structure. Of course, this deep structure is implicit only; it is not expressed but is only represented in the mind:

Now these subordinate propositions are often in our mind, without being expressed in words, as in the example cited [viz. "Invisible God created the visible world"]. (p. 68; PRG 100)

It is sometimes possible to express the deep structure in a more explicit way, in the surface form, "as when I reduce the above example to these terms: 'God WHO is invisible created the world WHICH is visible'" (pp. 68–69; PRG 100). But it constitutes an underlying mental reality – a mental accompaniment to the utterance – whether or not the surface form of the utterance that is produced corresponds to it in a simple, point-by-point manner.

In general, constructions of a noun with a noun in apposition, an adjective, or a participle are based on a deep structure containing a relative clause: "all these modes of speech include the relative pronoun in their meaning, and may be resolved by using it" (p. 69; PRG 100). The same deep structure may be realized differently in different languages, as when Latin has "video canem currentem," and French "Je voy un chien qui court" (pp. 69–70; PRG 100). The position of the relative pronoun in the "subordinate proposition" [*proposition incidente*] is determined by a rule that converts deep structure to surface structure. We see this, for example, in such phrases as "God whom I love" and "God by whom the world has been created." In such cases,

the relative pronoun is always placed at the beginning of the proposition (although, according to the meaning it ought to be only at the end), unless it is governed by a preposition, for the preposition comes first, at least ordinarily. (p. 71; PRG 101)

In the case of each of the sentences just discussed, the deep structure consists of a system of propositions, and it does not receive a direct, point-by-point expression in the actual physical object that is produced. To form an actual sentence from such an underlying system of elementary propositions, we

apply certain rules (in modern terms, grammatical transformations). In these examples, we apply the rule preposing the relative pronoun that takes the place of the noun of the incident proposition (along with the preposition that precedes it, if there is one). We may then, optionally, go on to delete the relative pronoun, at the same time deleting the copula (as in "Dieu invisible") or changing the form of the verb (as in "canis currens"). Finally, we must, in certain cases, interchange the order of the noun and the adjective (as in "un habile magistrat").[68]

The deep structure that expresses the meaning is common to all languages, so it is claimed, being a simple reflection of the forms of thought. The transformational rules that convert deep to surface structure may differ from language to language. The surface structure resulting from these transformations does not directly express the meaning relations of the words, of course, except in the simplest cases. It is the deep structure underlying the actual utterance, a structure that is purely mental, that conveys the semantic content of the sentence. This deep structure is, nevertheless, related to actual sentences in that each of its component abstract propositions (in the cases just discussed) could be directly realized as a simple propositional judgment.

The theory of essential and incident propositions as constituent elements of deep structure is extended in the Port-Royal *Logic*[69] with a more detailed analysis of relative clauses. There, a distinction is developed between *explica tive* (nonrestrictive or appositive) and *determinative* (restrictive) relative clauses. The distinction is based on a prior analysis of the "comprehension" and "extension" of "universal ideas,"[70] in modern terms, an analysis of meaning and reference. The comprehension of an idea is the set of essential attributes that define it, together with whatever can be deduced from them; its extension is the set of objects that it denotes:

> The comprehension of an idea is the constituent parts which make up the idea, none of which can be removed without destroying the idea. For example, the idea of a triangle is made up of the idea of having three sides, the idea of having three angles, and the idea of having angles whose sum is equal to two right angles, and so on.
>
> The extension of an idea is the objects to which the word expressing the idea can be applied. The objects which belong to the extension of an idea are called the inferiors of that idea, which with respect to them is called the superior. Thus, the general idea of triangle has in its extension triangles of all kinds whatsoever. (p. 51; PRL 39 40)

In terms of these notions, we can distinguish such "explications" as "Paris, which is the largest city in Europe" and "man, who is mortal" from "determinations" such as "transparent bodies, wise men" or "a body which is transparent, men who are pious" (pp. 59–60, 118; PRL 44–45, 89):

> A complex expression is a mere *explication* if either (1) the idea expressed by the complex expression is already contained in the comprehension of the idea expressed

by the principal word of the complex expression, or (2) the idea expressed by the complex expression is the idea of some accidental characteristic of all the inferiors of an idea expressed by the principal word. (pp. 59 60; PRL 45)

A complex expression is a *determination* if the extension of the idea expressed by the complex term is less than the extension of the idea expressed by the principal word. (p. 60; PRL 45)

In the case of an explicative relative clause, the underlying deep structure actually implies the judgment expressed by this clause, when its relative pronoun is replaced by its antecedent. For example, the sentence "men, who were created to know and love God, …" implies that men were created to know and love God. Thus an explicative relative clause has the essential properties of conjunction. But in the case of a restrictive relative clause (a determination), this is obviously not true. Thus in saying "Men who are pious are charitable," we do not affirm either that men are pious or that men are charitable. In stating this proposition,

we form a complex idea by joining together two simple ideas the idea of man and the idea of piety and we judge that the attribute of being charitable is part of this complex idea. Thus the subordinate clause asserts nothing more than that the idea of piety is not incompatible with the idea of man. Having made this judgment we then consider what idea can be affirmed of this complex idea of pious man. (p. 119; PRL 89 90)

Similarly, consider the expression "The doctrine which identifies the sovereign good with the sensual pleasure of the body, which was taught by Epicurus, is unworthy of a philosopher."[71] This contains the subject "The doctrine which … taught by Epicurus" and the predicate "unworthy of a philosopher." The subject is complex, containing the restrictive relative clause "which identifies the sovereign good with the sensual pleasure of the body" and the explicative relative clause "which was taught by Epicurus." The relative pronoun in the latter has as its antecedent the complex expression "the doctrine which identifies the sovereign good with the sensual pleasure of the body." Since the clause "which was taught by Epicurus" is explicative, the original sentence does imply that the doctrine in question was taught by Epicurus. But the relative pronoun of the restrictive clause cannot be replaced by its antecedent, "the doctrine," to form an assertion implied by the full sentence. Once again, the complex phrase containing the restrictive relative clause and its antecedent expresses a single complex idea formed from the two ideas of a doctrine and of identifying the sovereign good with the sensual pleasure of the body. All this information must be represented in the deep structure of the original sentence, according to the Port-Royal theory, and the semantic interpretation of this sentence must proceed in the manner just indicated, utilizing this information (pp. 119–120; PRL 90).

A restrictive relative clause is based on a proposition, according to the Port-Royal theory, even though this proposition is not affirmed when the

relative clause is used in a complex expression. What is affirmed in an expression such as men who are pious, as noted above, is no more than the compatibility of the constituent ideas. Hence in the expression "minds which are square are more solid than those which are round," we may correctly say that the relative clause is "false," in a certain sense, since "the idea of being square" is not compatible with "the idea of mind understood as the principle of thought" (p. 124; PRL 93).

Thus sentences containing explicative as well as restrictive relative clauses are based on systems of propositions (that is, abstract objects constituting the meanings of sentences);[72] but the manner of interconnection is different in the case of an explicative clause, in which the underlying judgment is actually affirmed, and a determinative clause, in which the proposition formed by replacing the relative pronoun by its antecedent is not affirmed but rather constitutes a single complex idea together with this noun.

These observations are surely correct, in essence, and must be accommodated in any syntactic theory that attempts to make the notion "deep structure" precise and to formulate and investigate the principles that relate deep structure to surface organization. In short, these observations must be accommodated in some fashion in any theory of transformational generative grammar. Such a theory is concerned precisely with the rules that specify deep structures and relate them to surface structures and with the rules of semantic and phonological interpretation that apply to deep and surface structures respectively. It is, in other words, in large measure an elaboration and formalization of notions that are implicit and in part expressly formulated in such passages as those just discussed. In many respects it seems to me quite accurate, then, to regard the theory of transformational generative grammar, as it is developing in current work, as essentially a modern and more explicit version of the Port-Royal theory.

In the Port-Royal theory, the relative pronoun that occurs in the surface form does not always have the dual function of standing for a noun and connecting propositions. It may be "shorn of its pronominal nature" and may thus serve only the latter role. For example, in such sentences as "I suppose that you will be wise" and "I tell you that you are wrong" we find that, in the deep structure, "these propositions, 'you will be wise', 'you are wrong', make up only part of the whole propositions 'I suppose …' and 'I tell you …'" (*Grammaire*, p. 73; PRG 104–105).[73]

The *Grammar* goes on to argue that infinitival constructions play the same role in the verbal system that relative clauses play in the nominal system, providing a means for extending the verbal system through the incorporation of whole propositions: "the infinitive is, among the other moods of the verb, what the relative is among the other pronouns" (pp. 111–112; PRG 139); like the relative pronoun, "the infinitive has, over and above the affirmation of the verb,

the power to join the proposition in which it appears to another proposition" (p. 112; PRG 139). Thus the meaning of "scio malum esse fugiendum" is conveyed by a deep structure based on the two propositions expressed by the sentences "scio" and "malum est fugiendum." The transformational rule (in modern terms) that forms the surface structure of the sentence replaces "est" by "esse", just as the transformations that form such sentences as "Dieu (qui est) invisible a créé le monde (qui est) visible" perform various operations of substitution, reordering, and deletion on the underlying systems of propositions. "And from this has come the fact that in French we almost always render the infinitive by the indicative of the verb and the particle 'que': 'Je sais que le mal est à fuir'" (p. 112; PRG 140). In this case, the identity of deep structure in Latin and French may be somewhat obscured by the fact that the two languages use slightly different transformational operations to derive the surface forms.

The *Grammar* goes on to point out that indirect discourse can be analyzed in a similar way.[74] If the underlying embedded proposition is interrogative, it is the particle "if" rather than "that" that is introduced by the transformational rule, as in "They asked me if I could do that," where the "discourse which is reported" is "Can you do that?" Sometimes, in fact, no particle need be added, a change of person being sufficient, as in "He asked me: Who are you?" as compared with "He asked me who I was" (p. 113; PRG 140–141).

Summarizing the Port-Royal theory in its major outlines, a sentence has an inner mental aspect (a deep structure that conveys its meaning) and an outer, physical aspect as a sound sequence. Its surface analysis into phrases may not indicate the significant connections of the deep structure by any formal mark or by the actual arrangement of words. The deep structure is, however, represented in the mind as the physical utterance is produced. The deep structure consists of a system of propositions, organized in various ways. The elementary propositions that constitute the deep structure are of the subject-predicate form, with simple subjects and predicates (i.e., categories instead of more complex phrases). Many of these elementary objects can be independently realized as sentences. It is not true, in general, that the elementary judgments constituting the deep structure are affirmed when the sentence that it underlies is produced; explicative and determinative relatives, for example, differ in this respect. To actually produce a sentence from the deep structure that conveys the thought that it expresses, it is necessary to apply rules of transformation that rearrange, replace, or delete items of the sentence. Some of these are obligatory, further ones optional. Thus "God, who is invisible, created the world, which is visible" is distinguished from its paraphrase, "Invisible God created the visible world," by an optional deletion operation, but the transformation that substitutes a relative pronoun for the noun and then preposes the pronoun is obligatory.

This account covers only the sentences based exclusively on judgments. But these, although the principal form of thought, do not exhaust the "operations of

our minds," and "one must still relate to what occurs in our mind the conjunctions, disjunctions, and other similar operations of our minds, and all the other movements of our souls, such as desires, commands, questions, etc." (p. 29; PRG 67). In part, these other "forms of thought" are signified by special particles such as "and," "not," "or," "if," "therefore," etc. (pp. 137–138; PRG 168). But with respect to these sentence types as well, an identity of deep structure may be masked through divergence of the transformational means whereby actual sentences are formed, corresponding to intended meanings. A case in point is interrogation. In Latin, the interrogative particle *ne* "has no object outside the mind, but only marks the movement of the soul, by which we wish to know a thing" (p. 138; PRG 168). As for the interrogative pronoun, "it is nothing more than a pronoun to which the signification of 'ne' is added; that is to say, which, beyond taking the place of a noun like the other pronouns, further marks this movement of the soul which desires to know something and which demands to be instructed about it" (p. 138; PRG 168). But this "movement of the soul" can be signified in various ways other than by the addition of a particle, for example, by vocal inflection or inversion of word order, as in French, where the pronominal subject is "transported" to the position following the person marker of the verb (preserving the agreement of the underlying form). These are all devices for realizing the same deep structure (pp. 138–139; PRG 168–169).

Notice that the theory of deep and surface structure as developed in the Port-Royal linguistic studies implicitly contains recursive devices and thus provides for infinite use of the finite means that it disposes, as any adequate theory of language must. We see, moreover, that, in the examples given, the recursive devices meet certain formal conditions that have no a priori necessity. In both the trivial cases (e.g., conjunction, disjunction, etc.) and the more interesting ones discussed in connection with relatives and infinitives, the only method for extending deep structures is by adding full propositions of a basic subject-predicate form. The transformational rules of deletion, rearrangement, etc., do not play a role in the creation of new structures. The extent to which the Port-Royal grammarians may have been aware of or interested in these properties of their theory is, of course, an open question.

In modern terms, we may formalize this view by describing the syntax of a language in terms of two systems of rules: a base system that generates deep structures and a transformational system that maps these into surface structures. The base system consists of rules that generate the underlying grammatical relations with an abstract order (the rewriting rules of a phrase-structure grammar); the transformational system consists of rules of deletion, rearrangement, adjunction, and so on. The base rules allow for the introduction of new propositions (that is, there are rewriting rules of the form $A \rightarrow \ldots S \ldots$, where S is the initial symbol of the phrase-structure grammar that constitutes the base);

there are no other recursive devices. Among the transformations are those which form questions, imperatives, etc., when the deep structure so indicates (i.e., when the deep structure represents the corresponding "mental act" in an appropriate notation).[75]

The Port-Royal grammar is apparently the first to develop the notion of phrase structure in any fairly clear way.[76] It is interesting, therefore, to notice that it also states quite clearly the inadequacy of phrase-structure description for the representation of syntactic structure and that it hints at a form of transformational grammar in many respects akin to that which is being actively studied today.

Turning from the general conception of grammatical structure to specific cases of grammatical analysis, we find many other attempts in the Port-Royal *Grammar* to develop the theory of deep and surface structure. Thus adverbs are analyzed as (for the most part) arising from "the desire that men have to abbreviate discourse," thus as being elliptical forms of preposition-noun constructions, for example, "wisely" for "with wisdom" or "today" for "on this day" (p. 88; PRG 121). Similarly, verbs are analyzed as containing implicitly an underlying copula that expresses affirmation; thus, once again, as arising from the desire to abbreviate the actual expression of thought. The verb, then, is "a word whose principal use[77] is to signify affirmation or assertion, that is, to indicate that the discourse where this word is employed is the discourse of a man who not only conceives things, but who judges and affirms them" (p. 90; PRG 122). To use a verb, then, is to perform the act of affirming, not simply to refer to affirmation as an "object of our thought," as in the use of "a number of nouns which also mean affirmation, such as 'affirmans' and 'affirmatio'" (p. 90; PRG 122). Thus the Latin sentence "Petrus vivit" has the meaning "Peter is living" (p. 90; PRG 123), and in the sentence "Petrus affirmat" "'affirmat' is the same as 'est affirmans'" (p. 98; PRG 128). It follows, then, that in the sentence "Affirmo" (in which subject, copula, and attribute are all abbreviated in a single word), two affirmations are expressed: one regarding the act of the speaker in affirming, the other the affirmation that he attributes (to himself, in this case). Similarly, "the verb 'nego' … contains an affirmation and a negation" (p. 98; PRG 128).[78]

Formulating these observations in the framework outlined above, what the Port-Royal grammarians are maintaining is that the deep structure underlying a sentence such as "Peter lives" or "God loves mankind" (*Logic*, p. 108; PRL 83) contains a copula, expressing the affirmation, and a predicate ("living," "loving mankind") attributed to the subject of the proposition. Verbs constitute a subcategory of predicates; they are subject to a transformation that causes them to coalesce with the copula into a single word.

The analysis of verbs is extended in the *Logic*, where it is maintained (p. 117) that, despite surface appearances, a sentence with a transitive verb and its object

"expresses a complex proposition and in one sense two propositions." Thus we can contradict the sentence "Brutus killed a tyrant" by saying that Brutus did not kill anyone or that the person whom Brutus killed was not a tyrant. It follows that the sentence expresses the proposition that Brutus killed someone who was a tyrant, and the deep structure must reflect this fact. It seems that this analysis would also apply, in the view of the *Logic*, if the object is a singular term; e.g., "Brutus killed Caesar."

This analysis plays a role in the theory of reasoning developed later on in the *Logic*. It is used to develop what is in effect a partial theory of relations, permitting the theory of the syllogism to be extended to arguments to which it would otherwise not apply. Thus it is pointed out (pp. 206–207; PRL 159–160) that the inference from "The divine law commands us to honor kings" and "Louis XIV is a king" to "The divine law commands us to honor Louis XIV" is obviously valid, though it does not exemplify any valid figure as it stands, superficially. By regarding "kings" as "the subject of a sentence contained implicitly in the original sentence," using the passive transformation[79] and otherwise decomposing the original sentence into its underlying prepositional constituents, we can finally reduce the argument to the valid figure *Barbara*.

Reduction of sentences to underlying deep structure is resorted to elsewhere in the *Logic*, for the same purpose. For example, Arnauld observes (p. 208; PRL 160) that the sentence *There are few pastors nowadays ready to give their lives for their sheep*, though superficially affirmative in form, actually "contains implicitly the negative sentence 'Many pastors nowadays are not ready to give their lives for their sheep." In general, he points out repeatedly that what is affirmative or negative "in appearance" may or may not be in meaning, that is, in deep structure. In short, the real "logical form" of a sentence may be quite different from its surface grammatical form.[80]

The identity of deep structure underlying a variety of surface forms in different languages is frequently stressed, throughout this period, in connection with the problem of how the significant semantic connections among the elements of speech are expressed. Chapter VI of the Port-Royal *Grammar* considers the expression of these relations in case systems, as in the classical languages, or by internal modification, as in the construct state in Hebrew, or by particles, as in the vernacular languages, or simply by a fixed word order,[81] as in the case of the subject–verb and verb–object relations in French. These are regarded as all being manifestations of an underlying structure common to all these languages and mirroring the structure of thought. Similarly, Lamy comments in his rhetoric on the diverse means used by various languages to express the "relations, and the consequence and interconnexion between all the ideas that the consideration of things excites in our mind" (*De L'Art de Parler*, pp. 10–11). The encyclopedist Du Marsais also stresses the fact that case systems express relations among the elements of discourse that are, in other

languages, expressed by word order or specific particles, and he points out the correlation between freedom to transpose and wealth of inflection.[82]

Notice that what is assumed is the existence of a uniform set of relations into which words can enter, in any language, these corresponding to the exigencies of thought. The philosophical grammarians do not try to show that all languages literally have case systems, that they use inflectional devices to express these relations. On the contrary, they repeatedly stress that a case system is only one device for expressing these relations. Occasionally, they point out that case names can be assigned to these relations as a pedagogic device; they also argue that considerations of simplicity sometimes may lead to a distinction of cases even where there is no difference in form. The fact that French has no case system is in fact noted in the earliest grammars. Cf. Sahlin, p. 212.

It is important to realize that the use of the names of classical cases for languages with no inflections implies only a belief in the uniformity of the grammatical relations involved, a belief that deep structures are fundamentally the same across languages, although the means for their expression may be quite diverse. This claim is not obviously true – it is, in other words, a nontrivial hypothesis. So far as I know, however, modern linguistics offers no data that challenge it in any serious way.[83]

As noted above, the Port-Royal theory of grammar holds that for the most part, adverbs do not, properly speaking, constitute a category of deep structure but function only "for signifying in a single word what could otherwise be indicated only by a preposition and a noun" (p. 88; PRG 121). Later grammarians simply drop the qualification to "for the most part." Thus for Du Marsais, "what distinguishes adverbs from other kinds of words is that adverbs have the value of a preposition and a noun, or a preposition with its complement: they are words which abbreviate" (p. 660). This is an unqualified characterization, and he goes on to analyze a large class of items in this way – in our paraphrase, as deriving from a deep structure of the form: preposition–complement. This analysis is carried still further by Beauzée.[84] He, incidentally, maintains that, although an "adverbial phrase" such as "with wisdom" does not differ from the corresponding adverb "wisely" in its "signification," it may differ in the "accessory ideas" associated with it: "when it is a matter of contrasting an action with a habit, the adverb is more appropriate for indicating the habit and the adverbial phrase for indicating the action; thus I would say 'A man who conducts himself wisely cannot promise that all his actions will be performed with wisdom'" (p. 342).[85] This distinction is a particular case of "the antipathy that all languages naturally show towards a total synonymity, which would enrich an idiom only with sounds that do not subserve accuracy and clarity of expression."

Earlier grammarians provide additional instances of analysis in terms of deep structure, as, for example, when imperatives and interrogatives are analyzed as,

in effect, elliptical transforms of underlying expressions with such supplementary terms as "I order you …" or "I request…"[86] Thus "Come see me" has the deep structure "I order/beg you to come see me"; "Who found it?" has the meaning of "I ask who found it?" etc.

Still another example that might be cited is the transformational derivation of expressions with conjoined terms from underlying sentences, in the obvious way; for example, in Beauzée, op. cit., pp. 399f. Beauzée's discussion of conjunctions also provides somewhat more interesting cases, as, for example, when he analyzes "how" [*comment*] as based on an underlying form with "manner" [*manière*] and a relative clause, so that the sentence "I know how it happened" has the meaning of "I know the manner in which it happened"; or when he analyzes "the house which I acquired." In this way, the underlying deep structure with its essential and incident propositions is revealed.

An interesting further development, along these lines, is carried out by Du Marsais in his theory of *construction* and *syntax*.[87] He proposes that the term "construction" be applied to "the arrangement of words in discourse," and the term "syntax," to "the relations which words bear to one another." For example, the three sentences "accepi litteras tuas," "tuas accepi litteras," and "litteras accepi tuas" exhibit three different constructions, but they have the same syntax; the relations among the constituent elements are the same in all three cases. "Thus, each of these three arrangements produces the same meaning [*sens*] in the mind: 'I have received your letter'." He goes on to define "syntax" as "what brings it about, in every language, that words produce the meaning we wish to arise in the minds of those who know the language … the part of grammar that provides knowledge of the signs established in a language to produce understanding in the mind" (pp. 229–231). The syntax of an expression is thus essentially what we have called its deep structure; its construction is what we have called its surface structure.[88]

The general framework within which this distinction is developed is the following. An act of the mind is a single unit. For a child, the "idea" [*sentiment*] that sugar is sweet is at first an unanalyzed, single experience (p. 181); for the adult, the meaning of the sentence "Sugar is sweet," the thought that it expresses, is also a single entity. Language provides an indispensable means for the analysis of these otherwise undifferentiated objects. It provides a

> means of clothing our thought, so to speak, of rendering it perceptible, of dividing it, of analyzing it in a word, of making it such that it is communicable to others with more precision and detail.
>
> Thus, particular thoughts are each an ensemble, so to speak, a whole that the usage of language divides, analyzes and distributes into parts by means of different articulations of the speech organs which form the words. (p. 184)

Similarly, the perception of speech is a matter of determining the unified and undifferentiated thought from the succession of words. "[The words] work together to produce the whole sense or the thought we wish to arise in the

minds of those who read or hear them" (p. 185). To determine this thought, the mind must first discover the relations among the words of the sentence, that is, its syntax; it must then determine the meaning, given a full account of this deep structure. The method of analysis used by the mind is to bring together those words that are related, thus establishing a "meaningful order" [*ordre significatif*] in which related elements are successive. The actual sentence may, in itself, have this "meaningful order," in which case it is called a "simple construction (natural, necessary, meaningful, assertive)" (p. 232). Where it does not, this "meaningful order" must be reconstructed by some procedure of analysis – it must be "re-established by the mind, which grasps the meaning [*sens*] only by this order" (pp. 191–192). To understand a sentence of Latin, for example, you must reconstruct the "natural order" that the speaker has in his mind (p. 196). You must not only understand the meanings of each word, but, furthermore,

> you would not understand anything in it except by putting together in your mind the words in their relation to one another, and you can do this only after you have heard the whole sentence. (pp. 198 199)

In Latin, for example, it is the "relative word-endings which makes us consider the words in the completed proposition in accordance with the order of their interrelations, and hence in accordance with the order of the *simple, necessary and meaningful construction*" (pp. 241–242). This "simple construction" is an "order which is always indicated, but rarely observed in the usual construction of languages whose nouns have cases" (p. 251). Reduction to the "simple construction" is an essential first step in speech perception:

> The words form a whole that has parts. The simple perception of the relations between these parts makes us conceive the whole of them, and comes to us solely from the simple construction. Setting forth the words in accordance with the order of succession of their relations, this presents them in a manner that is best fitted to make us recognize these relations and to make the whole thought arise. (pp. 287 288)

Constructions other than the "simple constructions" (namely, "figurative constructions" [*constructions figurées*])

> are understood only because the mind corrects their irregularities, with the help of accessory ideas which make us conceive what we read and hear as if the sense were expressed in the order of the simple construction … (p. 292)

In short, in the "simple construction" the relations of "syntax" are represented directly in the associations among successive words, and the undifferentiated thought expressed by the sentence is derived directly from this underlying representation, which is regarded, throughout, as common to all languages (and, typically, as corresponding to the usual order of French – cf., e.g., p. 193).

The transformations which form a "figurative construction" effect reordering and ellipsis. The "fundamental principle of all syntax" (p. 218) is that reordering

and ellipsis must be recoverable by the mind of the hearer (cf. pp. 202, 210ff., 277); that is, they can be applied only when it is possible to recover uniquely "the strict metaphysical order" of the "simple construction."[89]

Many examples of reduction to simple constructions are presented to illustrate this theory.[90] Thus the sentence "Who said it?" is reduced to the simple construction "The one who said it is which person?" (Sahlin, p. 93); the sentence "Being loved as much as lovers, you are not forced to shed tears" is reduced to "Since you are loved as much as you are lovers, …"; the sentence "It is better to be just than to be rich, to be reasonable than to be wise" is reduced to four underlying propositions, two negative, two positive, in the obvious way (p. 109), etc.

A rather different sort of example of the distinction between deep and surface structure is provided by Du Marsais in his analysis (pp. 179–180) of such expressions as "I have an idea/fear/doubt," etc. These, he says, should not be interpreted as analogous to the superficially similar expressions "I have a book/diamond/watch," in which the nouns are "names of real objects that exist independently of our thought [*manière de penser*]." In contrast, the verb in "I have an idea" is "a borrowed [*empruntée*] expression," produced only "by imitation." The meaning of "I have an idea" is simply "I am thinking" or "I am conceiving something in such-and-such a way." Thus the grammar gives no license for supposing that such words as "idea," "concept," "image" stand for "real objects," let alone "perceptible objects." From this grammatical observation it is only a short step to a criticism of the theory of ideas, in its Cartesian and empiricist forms, as based on a false grammatical analogy. This step is taken by Thomas Reid, shortly after.[91]

As Du Marsais indicates with abundant references, his theory of construction and syntax is foreshadowed in scholastic and renaissance grammar (see note 67). But he follows the Port-Royal grammarians in regarding the theory of deep and surface structure as, in essence, a psychological theory, not merely a means for the elucidation of given forms or for analysis of texts. As indicated above, it plays a role in his hypothetical account of the perception and production of speech, just as, in the Port-Royal *Grammar*, the deep structure is said to be represented "in the mind" as the utterance is heard or produced.

As a final example of the attempt to discover the hidden regularities underlying surface variety, we may mention the analysis of French indefinite articles in Chapter VII of the Port-Royal *Grammar*, where it is argued, on grounds of symmetry of patterning, that *de* and *des* play the role of the plural of *un*, as in *Un crime si horrible mérite la mort, Des crimes si horribles méritent la mort, De si horribles crimes méritent la mort*, etc. To handle the apparent exception, *Il est coupable de crimes horribles (d'horribles crimes)*, they propose the "rule of cacophony" that a *de de* sequence is replaced by *de*. They also note the use of *des* as a realization of the definite article, and other uses of these forms.

Perhaps these comments and examples are sufficient to suggest something of the range and character of the grammatical theories of the "philosophical grammarians." As noted above, their theory of deep and surface structure relates directly to the problem of creativity of language use, discussed in the first part of the present work.

From the standpoint of modern linguistic theory, this attempt to discover and characterize deep structure and to study the transformational rules that relate it to surface form is something of an absurdity;[92] it indicates lack of respect for the "real language" (i.e., the surface form) and lack of concern for "linguistic fact." Such criticism is based on a restriction of the domain of "linguistic fact" to physically identifiable subparts of actual utterances and their formally marked relations.[93] Restricted in this way, linguistics studies the use of language for the expression of thought only incidentally, to the quite limited extent to which deep and surface structure coincide; in particular, it studies "sound-meaning correspondences" only in so far as they are representable in terms of surface structure. From this limitation follows the general disparagement of Cartesian and earlier linguistics,[94] which attempted to give a full account of deep structure even where it is not correlated in strict point-by-point fashion to observable features of speech. These traditional attempts to deal with the organization of semantic content as well as the organization of sound were defective in many ways, but modern critique generally rejects them more for their scope than for their failures.

Description and explanation in linguistics

Within the framework of Cartesian linguistics, a descriptive grammar is concerned with both sound and meaning; in our terminology, it assigns to each sentence an abstract deep structure determining its semantic content and a surface structure determining its phonetic form. A complete grammar, then, would consist of a finite system of rules generating this infinite set of paired structures and thus showing how the speaker-hearer can make infinite use of finite means in expressing his "mental acts" and "mental states."

However, Cartesian linguistics was not concerned simply with descriptive grammar, in this sense, but rather with "grammaire générale," that is, with the universal principles of language structure. At the very outset of the work under review, a distinction was made between general and particular grammar. These are characterized by Du Marsais in the following way:

> Some points [*observations*] of grammar apply to all languages. These form what we call general grammar for example, those we made regarding articulated sounds and the letters which are the signs of these sounds, the nature of words and the various ways they must be ordered or terminated in order to have meaning. Apart from these general points, there are some which are peculiar to one particular language, and these form the special grammar of that language.[95]

Beauzée elaborates the distinction in the following way:

> Grammar, whose object is the expression of thought with the help of spoken or written words, comprises two sorts of principles. One sort, being immutably true and universally applicable, derive from the nature of thought itself, following its analysis and being its result. The other sort are only hypothetically true and depend on conventions which, being accidental, arbitrary and changeable, have given rise to different idioms. The first sort of principles constitute general grammar and the second are the object of various particular grammars.
>
> General grammar is therefore the rational science of the immutable and general principles of spoken or written Language [*Langage*], whatever language [*langue*] this may be.
>
> A particular grammar is the art of applying the arbitrary and usual conventions of a particular language to the immutable and general conventions of written or spoken Language.

General Grammar is a *science*, because its object is rational speculation on the immutable and general principles of Language.

A *particular Grammar* is an *art*, because it considers the practical application of the arbitrary and usual conventions of a particular language to the general principles of Language.

The *science of grammar* is anterior to all languages in so far as its principles presuppose only the possibility of languages and are the same as those which guide human reason in its intellectual operations; in short, because they are eternally true.

The *art of grammar*, by contrast, is posterior to languages in so far as linguistic usages must exist before they can stand in an artificial relation to the general principles of Language, and the analogical systems that form this art can be determined only by observations made on these pre existent usages.[96]

In his *Eloge de du Marsais*, D'Alembert gives this account of "philosophical grammar":

Grammar is therefore the work of philosophers. Only a philosophical mind can ascend to the principles on which its rules are based … This mind first recognizes, in the grammar of each language, the general principles which are common to all of them, and which form General Grammar. It then distinguishes, among the usages peculiar to each language, those which can be founded on reason from those which are the work of chance or negligence: it observes the reciprocal influences that languages have had on each other and the alterations that this mingling has brought about without entirely destroying their individual character; it weighs their mutual advantages and disadvan tages; differences in their construction …; the diversity of their genius …; their richness and freedom, poverty and servitude. The development of these various factors is the true metaphysics of grammar. Its object … is to advance the human mind in the generation of its ideas and in the use it makes of words to transmit thoughts to other men.[97]

The discovery of universal principles would provide a partial explanation for the facts of particular languages, in so far as these could be shown to be simply specific instances of the general features of language structure formulated in the "grammaire générale." Beyond this, the universal features themselves might be explained on the basis of general assumptions about human mental processes or the contingencies of language use (for example, the utility of elliptical transformations). Proceeding in this way, Cartesian linguistics attempts to develop a theory of grammar that is not only "general" but also "explanatory" [*raisonnée*].

The linguistics of Port-Royal and its successors developed in part in reaction against the prevailing approaches represented, for example, in such work as Vaugelas's *Remarques sur la langue françoise* (1647).[98] Vaugelas's goal is simply to describe usage "which everyone recognizes as the master and ruler of living languages" (Preface). His book is called *Remarques* … rather than *Décisions* … or *Loix* … because he is "a simple observer [*tesmoin*]." He disclaims any intention of explaining the facts of speech or finding general principles that underlie them, just as he generally suggests no modification or "purification" of usage on rational or esthetic grounds. His grammar, then, is

neither "explanatory" nor prescriptive.[99] He is quite aware of the problems of determining actual usage and provides an interesting discussion of "elicitation procedures" (pp. 503f.), in which, among other things, he points out the inadequacy of the kinds of "direct question" tests for grammaticalness that have occasionally been proposed and applied by structural linguists, with predictably inconclusive results. He does not restrict his descriptive comments to surface structure.[100] For example, he points out that one cannot determine from the form of a word whether it has an "active meaning" [*signification*] or a "passive meaning" or, ambiguously, both (pp. 562–563). Thus in the sentence "My esteem isn't something from which you can derive any great advantage," the phrase "my esteem" has the sense "the esteem which I hold for you," whereas in the sentence "My esteem does not depend on you," it means "the esteem in which I am held" or "the esteem in which I may be held;" and the same is true of such words as "aid," "help," and "opinion." There are other examples of a concern for descriptive adequacy on a broad scale. At the same time, Vaugelas's work foreshadows many of the defects of modern linguistic theory, for example, in his failure to recognize the creative aspect of language use. Thus he regards normal language use as constructed of phrases and sentences that are "authorized by usage," although new words (e.g., *brusqueté, pleurement*) can be correctly formed by analogy (pp. 568f). His view of language structure, in this respect, seems not very different from that of Saussure, Jespersen, Bloomfield, and many others who regard innovation as possible only "by analogy," by substitution of lexical items for items of the same category within fixed frames (cf. p. 65 above).

The reaction of "philosophical grammar" is not against the descriptivism of Vaugelas and others as such[101] but against the restriction to *pure* descriptivism. The Port-Royal *Grammar* takes it as a general maxim for anyone working on a living language that "the ways of speaking that are authorised by undisputed general usage must be accepted as good even if they go against the rules and analogy of the language" (p. 83; PRG 113). Lamy, in his rhetoric, echoes Vaugelas in describing usage as "the master and arbitrary ruler of languages" and in holding that "no one may contest this rule which necessity has established and the general agreement of people has confirmed" (op. cit., p. 31). Du Marsais insists that "the philosophical grammarian must consider the particular language he is studying in relation to what this language is in itself and not in relation to another language."[102] Philosophical grammar, then, was not characteristically attempting to refine or improve language, but to discover its underlying principles and to explain the particular phenomena that are observed.[103]

The example which, for more than a century, was used to illustrate this difference between descriptive and explanatory grammar was provided by a rule of Vaugelas (pp. 385f.) regarding relative clauses, namely, the rule that a relative clause may not be added to a noun that has no articles or only the "article

indefini" *de*. Thus one cannot say "II a fait cela par avarice, qui est capable de tout" or "II a fait cela par avarice, dont la soif ne se peut esteindre." Similarly, one cannot say "II a esté blessé d'un coup de fleche, qui estoit empoisonnée" (p. 385), although it is correct to say "II a esté blessé de la fleche, qui estoit empoisonnée" or "II a esté blessé d'une fleche qui estoit empoisonnée."

In Chapter IX, the Port-Royal *Grammar* first notes a variety of exceptions to this rule and then proposes a general explanatory principle to account both for the examples that fall under the rule of Vaugelas and for the exceptions to his rule.[104] The explanation is, once again, based on the distinction between meaning and reference. In the case of a "common noun," the meaning [*signification*] is fixed (except for ambiguity or metaphor), but the reference [*estendue*] varies, depending on the noun phrase in which the noun appears. A particular occurrence of a noun is called *indeterminate* "when there is nothing that indicates whether it must be taken generally or particularly and, if the latter, whether for a determinate or indeterminate particular" (p. 77; PRG 109); otherwise, it is *determinate*. Vaugelas's rule is now restated in terms of *determination*: "in current French usage one may not put *qui* after a common noun unless it is determined by an article or some other thing that determines it no less than it would be determined by an article" (p. 77; PRG 109). A detailed analysis follows, attempting to show that the apparent counter-examples involve occurrences of nouns that are "determined" by some feature other than the article. In part, the analysis is based on assumptions about deep structure that are not without interest in themselves. The rule is also discussed by Du Marsais, Beauzée, and others at some length. We need not go into the details here. The point, in the present context, is that this was taken as a paradigm example of the necessity for supplementing descriptive statements with a rational explanation, if linguistics was to go beyond compilation of facts to true "science" – in the terminology of the day, if grammar was to become "philosophical."

In connection with the rule of Vaugelas and several other cases, the explanations that are proposed, in universal grammar, have some substance and linguistic content. All too often, however, they are quite empty, and invoke assumptions about underlying mental reality in a quite mechanical and unrevealing way. In fact, it seems to me that in general the modern critique of "philosophical grammar" is quite misplaced. The error of this position is generally taken to be its excessive rationality and a priorism and its disregard for linguistic fact. But a more cogent criticism is that the tradition of philosophical grammar is too limited to mere description of fact – that it is insufficiently "raisonnée"; that is, it seems to me that the faults (or limitations) of this work are just the opposite of those which have been attributed to it by modern critics. The philosophical grammarians considered a wide realm of particular examples; they tried to show, for each example, what was the deep structure that underlies its surface form and expresses the relations among elements that determine its meaning. To this extent, their

work is purely descriptive (just as modern linguistics is purely descriptive in pursuit of its more restricted goal of identifying the units that constitute the surface structure of particular utterances, their arrangement into phrases, and their formally marked relations). Reading this work, one is constantly struck by the ad hoc character of the analysis, even where it seems factually correct. A deep structure is proposed that does convey the semantic content, but the basis for its selection (beyond mere factual correctness) is generally unformulated. What is missing is a theory of linguistic structure that is articulated with sufficient precision and is sufficiently rich to bear the burden of justification. Although the examples of deep structure that are given in abundance often seem quite plausible, they are unsatisfying, just as modern linguistic descriptions, though often quite plausible in their analysis of particular utterances into phonemes, morphemes, words, and phrases, remain unsatisfying, and for the same reason. In neither case do we have an underlying hypothesis as to the general nature of language that is sufficiently strong as to indicate why just these and not other descriptions are selected by the child acquiring the language or the linguist describing it, on the basis of the data available to them.[105]

What is more, there is little recognition in philosophical grammar of the intricacy of the mechanisms that relate deep to surface structure, and, beyond the general outlines sketched above, there is no detailed investigation of the character of the rules that appear in grammars or the formal conditions that they satisfy. Concomitantly, no clear distinction is made between the abstract structure underlying a sentence and the sentence itself. It is, by and large, assumed that the deep structure consists of actual sentences in a simpler or more natural organization and that the rules of inversion, ellipsis, and so on, that form the full range of actual sentences simply operate on these already formed simple sentences. This point of view is explicit, for example, in Du Marsais's theory of construction and syntax, and it is undoubtedly the general view throughout.[106] The totally unwarranted assumption that a deep structure is nothing other than an arrangement of simple sentences can be traced to the Cartesian postulate that, quite generally, the principles that determine the nature of thought and perception must be accessible to introspection and can be brought to consciousness, with care and attention.

Despite these shortcomings, the insights into the organization of grammar that were achieved in Cartesian linguistics remain quite impressive, and a careful study of this work can hardly fail to prove rewarding to a linguist who approaches it without prejudice or preconceptions as to the a priori limitations on permitted linguistic investigation. Beyond these achievements, the universal grammarians of the seventeenth and eighteenth centuries have made a contribution of lasting value by the very fact that they posed so clearly the problem of changing the orientation of linguistics from "natural history" to "natural philosophy" and by stressing the importance of the search for universal principles and for rational explanation of linguistic fact, if progress is to be made toward this goal.

Acquisition and use of language

We have so far extracted from "Cartesian linguistics" certain characteristic and quite important doctrines regarding the nature of language and have, quite sketchily, traced their development during the period from Descartes to Humboldt. As a by-product of this study of *langue*, and against the background of rationalist theory of mind, certain views emerged as to how language is acquired and used. After a long interlude, these views are once again beginning to receive the attention that they deserve, although their appearance (like the reappearance of the central ideas of transformational grammar) was, in fact, a largely independent development.

The central doctrine of Cartesian linguistics is that the general features of grammatical structure are common to all languages and reflect certain fundamental properties of the mind. It is this assumption which led the philosophical grammarians to concentrate on "grammaire générale" rather than "grammaire particulière" and which expresses itself in Humboldt's belief that deep analysis will show a common "form of language" underlying national and individual variety.[107] There are, then, certain language universals that set limits to the variety of human language.[108] The study of the universal conditions that prescribe the form of any human language is "grammaire générale." Such universal conditions are not learned; rather, they provide the organizing principles that make language learning possible, that must exist if data are to lead to knowledge. By attributing such principles to the mind, as an innate property, it becomes possible to account for the quite obvious fact that the speaker of a language knows a great deal that he has not learned.

In approaching the question of language acquisition and linguistic universals in this way, Cartesian linguistics reflects the concern of seventeenth-century rationalistic psychology with the contribution of the mind to human knowledge. Perhaps the earliest exposition of what was to become a major theme, throughout most of this century, is Herbert of Cherburys *De Veritate* (1624),[109] in which he develops the view that there are certain "principles or notions implanted in the mind" that "we bring to objects from ourselves … [as] … a direct gift of Nature, a precept of natural instinct" (p. 133). Although these Common Notions "are stimulated by objects," nevertheless, "no one, however wild his views,

imagines that they are conveyed by objects themselves" (p. 126). Rather, they are essential to the identification of objects and the understanding of their properties and relations. Although the "intellectual truths" comprised among the Common Notions "seem to vanish in the absence of objects, yet they cannot be wholly passive and idle seeing that they are essential to objects and objects to them … It is only with their aid that the intellect, whether in familiar or new types of things, can be led to decide whether our subjective faculties have accurate knowledge of the facts" (p. 105). By application of these intellectual truths, which are "imprinted on the soul by the dictates of Nature itself," we can compare and combine individual sensations and interpret experience in terms of objects, their properties, and the events in which they participate Evidently, these interpretive principles cannot be learned from experience in their entirety, and they may be independent of experience altogether. According to Herbert:

> [They] are so far from being drawn from experience or observation that, without several of them, or at least one of them, we could have no experience at all nor be capable of observations. For if it had not been written in our soul that we should examine into the nature of things (and we do not derive this command from objects), and if we had not been endowed with Common Notions, to that end, we should never come to distinguish between things, or to grasp any general nature. Vacant forms, prodigies, and fearful images would pass meaninglessly and even dangerously before our minds, unless there existed within us, in the shape of notions imprinted in the mind, that analogous faculty by which we distinguish good from evil. From where else could we have received knowl edge? In consequence, anyone who considers to what extent objects in their external relationship contribute to their correct perception; who seeks to estimate what is con tributed by us, or to discover what is due to alien or accidental sources, or again to innate influences, or to factors arising from nature, will be led to refer to these principles. We listen to the voice of nature not only in our choice between what is good and evil, beneficial and harmful, but also in that external correspondence by which we distinguish truth from falsehood, we possess hidden faculties which when stimulated by objects quickly respond to them. (pp. 105 106)

It is only by the use of these "inborn capacities or Common Notions" that the intellect can determine "whether our subjective faculties have exercised their perceptions well or ill" (p. 87). This "natural instinct" thus instructs us in the nature, manner, and scope of what is to be heard, hoped for, or desired" (p. 132).

Care must be taken in determining what are the Common Notions, the innate organizing principles and concepts that make experience possible. For Herbert, the "chief criterion of Natural Instinct" is "universal consent" (p. 139). But two qualifications are necessary. First, what is referred to is universal consent among "normal men" (p. 105). That is, we must put aside "persons who are out of their minds or mentally incapable" (p. 139) and those who are "headstrong, foolish, weak-minded and imprudent" (p. 125). And although these faculties "may not ever be entirely absent," and "even in madmen, drunkards, and infants extra-ordinary internal powers may be detected which minister to their safety"

(p. 125), still we can expect to find universal consent to Common Notions only among the normal, rational, and clearheaded. Second, appropriate experience is necessary to elicit or activate these innate principles; "it is the law or destiny of Common Notions and indeed of the other forms of knowledge to be inactive unless objects stimulate them" (p. 120). In this respect, the common notions are like the faculties of seeing, hearing, loving, hoping, etc., with which we are born and which "remain latent when their corresponding objects are not present, and even disappear and give no sign of their existence" (p. 132). But this fact must not blind us to the realization that "the Common Notions must be deemed not so much the outcome of experience as principles without which we should have no experience at all" and to the absurdity of the theory that "our mind is a clean sheet, as though we obtained our capacity for dealing with objects from objects themselves" (p. 132).

The common notions are "all intimately connected" and can be arranged into a system (p. 120); and although "an infinite number of faculties may be awakened in response to an infinite number of new objects, all the Common Notions which embrace this order of facts may be comprehended in a few propositions" (p. 106). This system of common notions is not to be identified with "reason." It simply forms "that part of knowledge with which we were endowed in the primeval plan of Nature," and it is important to bear in mind that "it is the nature of natural instinct to fulfil itself irrationally, that is to say, without foresight." On the other hand, "reason is the process of applying Common Notions as far as it can" (pp. 120–121).

In focusing attention on the innate interpretive principles that are a precondition for experience and knowledge and in emphasizing that these are implicit and may require external stimulation in order to become active or available to introspection, Herbert expressed much of the psychological theory that underlies Cartesian linguistics, just as he emphasized those aspects of cognition that were developed by Descartes and, later, by the English Platonists, Leibniz, and Kant.[110]

The psychology that develops in this way is a kind of Platonism without preexistence. Leibniz makes this explicit in many places. Thus he holds that "nothing can be taught us of which we have not already in our minds the idea," and he recalls Plato's "experiment" with the slave boy in the *Meno* as proving that "the soul virtually knows those things [i.e., truths of geometry, in this case], and needs only to be reminded (animadverted) to recognize the truths. Consequently, it possesses at least the idea upon which these truths depend. We may say even that it already possesses those truths, if we consider them as the relations of the ideas" (§26).[111]

Of course, what is latent in the mind in this sense may often require appropriate external stimulation before it becomes active, and many of the innate principles that determine the nature of thought and experience may well be

applied quite unconsciously. This Leibniz emphasizes, in particular, throughout his *Nouveaux Essais*.

That the principles of language and natural logic are known unconsciously[112] and that they are in large measure a precondition for language acquisition rather than a matter of "institution" or "training" is the general presupposition of Cartesian linguistics.[113] When Cordemoy, for example, considers language acquisition (op. cit., pp. 40ff.), he discusses the role of instruction and conditioning of a sort, but he also notices that much of what children know is acquired quite apart from any explicit instruction,[114] and he concludes that language learning presupposes possession of "wholly developed reason [*la raison toute entière*] for indeed this way of learning to speak is the result of discernment so great and reason so perfect that it is impossible to conceive of any more marvelous" (p. 59).

Rationalist conclusions reappear with some of the romantics as well. Thus A. W. Schlegel writes that "human reason may be compared to a substance which is infinitely combustible but does not burst into flame on its own: a spark must be thrown into the soul" ("De l'étymologie en général," p. 127). Communication with an already formed intellect is necessary for reason to awaken. But external stimulation is only required to set innate mechanisms to work; it does not determine the form of what is acquired. In fact, it is clear "that this acquisition [of language] through communication already presupposes the ability to invent language" (*Kunstlehre*, p. 234). In a certain sense, language is innate to man; namely, "in the truer philosophical sense in which everything that, according to the usual view, is innate to man, can only be brought forth through his own activity" (ibid., p. 235). While Schlegel's precise intentions, with many such remarks, might be debated, in Humboldt the Platonism with respect to language acquisition is quite clear. For Humboldt, "to learn is … always merely to regenerate" (op. cit., p. 126). Despite superficial appearances, a language "cannot properly be taught but only awakened in the mind; it can only be given the threads by which it develops on its own account"; thus languages are, in a sense, "self-creations" [*Selbstschöpfungen*] of individuals (p. 50; Humboldt 1999: 43–4):

> Language learning of children is not an assignment of words, to be deposited in memory and rebabbled by rote through the lips, but a growth in linguistic capacity with age and practice. (p. 71)

> That in children there is not a mechanical learning of language, but a development of linguistic power, is also proven by the fact that since the major abilities of humans are allotted a certain period of life for their development, all children, under the most diverse conditions, speak and understand at about the same age, varying only within a brief time span. (p. 72; Humboldt 1999: 58)

In short, language acquisition is a matter of growth and maturation of relatively fixed capacities, under appropriate external conditions. The form of

the language that is acquired is largely determined by internal factors; it is because of the fundamental correspondence of all human languages, because of the fact that "human beings are the same, wherever they may be" [*der Mensch überall Eins mit dem Menschen ist*], that a child can learn any language (p. 73).[115] The functioning of the language capacity is, furthermore, optimal at a certain "critical period" of intellectual development.

It is important to emphasize that seventeenth-century rationalism approaches the problem of learning – in particular, language learning – in a fundamentally nondogmatic fashion. It notes that knowledge arises on the basis of very scattered and inadequate data and that there are uniformities in what is learned that are in no way uniquely determined by the data itself (see note 114). Consequently, these properties are attributed to the mind, as preconditions for experience. This is essentially the line of reasoning that would be taken, today, by a scientist interested in the structure of some device for which he has only input–output data. In contrast, empiricist speculation, particularly in its modern versions, has characteristically adopted certain a priori assumptions regarding the nature of learning (that it must be based on association or reinforcement, or on inductive procedures of an elementary sort – e.g., the taxonomic procedures of modern linguistics, etc.) and has not considered the necessity for checking these assumptions against the observed uniformities of "output" – against what is known or believed after "learning" has taken place. Hence the charge of a priorism or dogmatism often leveled against rationalistic psychology and philosophy of mind seems clearly to be misdirected. (For further discussion, see the references in note 110.)

The strong assumptions about innate mental structure made by rationalistic psychology and philosophy of mind eliminated the necessity for any sharp distinction between a theory of perception and a theory of learning. In both cases, essentially the same processes are at work; a store of latent principles is brought to the interpretation of the data of sense. There is, to be sure, a difference between the initial "activation" of latent structure and the use of it once it has become readily available for the interpretation (more accurately, the determination) of experience. The confused ideas that are always latent in the mind may, in other words, become distinct (see note 111), and at this point they can heighten and enhance perception. Thus, for example, a

> skilful and expert limner will observe many elegancies and curiosities of art, and be highly pleased with several strokes and shadows in a picture, where a common eye can discern nothing at all; and a musical artist hearing a consort of exact musicians playing some excellent composure of many parts, will be exceedingly ravished with many harmonical airs and touches, that a vulgar ear will be utterly insensible of. (Cudworth, op. cit., p. 446; Cudworth 1996: 109)

It is the "acquired skill" that makes the difference; "the artists of either kind have many inward anticipations of skill and art in their minds" that enable them to interpret the data of sense in a way that goes beyond the "mere noise and sound

and clatter" provided by passive sense, just as the informed mind can interpret the "vital machine of the universe" in terms of "interior symmetry and harmony in the relations, proportions, aptitudes and correspondence of things to one another in the great mundane system" (ibid.). Similarly, in looking at and "judging of" a picture of a friend, one makes use of a "foreign and adventitious" but preexistent idea (pp. 456–457; Cudworth 1996: 109). Once this distinction between learning and perception has been noted, however, the essential parallel between the cognitive processes that are involved outweighs the relatively superficial differences, from the point of view of this rationalist doctrine. For this reason, it is often unclear whether what is being discussed is the activity of the mind in perception or in acquisition – that is, in selecting an already distinct idea on the occasion of sense, or in making distinct what was before only confused and implicit.

Descartes's theory of cognition is clearly summarized in his *Comments on a Certain Broadsheet* (1648):

> …if we bear well in mind the scope of our senses and what it is exactly that reaches our faculty of thinking by way of them, we must admit that in no case are the ideas of things presented to us by the senses just as we form them in our thinking. So much so that there is nothing in our ideas which is not innate to the mind or the faculty of thinking, with the sole exception of those circumstances which relate to experience, such as the fact that we judge this or that idea which we now have immediately before our mind refers to a certain thing situated outside us. We make such a judgement not because these things transmit the ideas to our mind through the sense organs, but because they transmit something which, at exactly that moment, gives the mind occasion to form these ideas by means of the faculty innate to it. Nothing reaches our mind from external objects through the sense organs except certain corporeal motions … But neither the motions themselves nor the figures arising from them are conceived by us exactly as they occur in the sense organs … Hence it follows that the very ideas of the motions themselves and of the figures are innate in us. The ideas of pain, colours, sounds, and the like must be all the more innate if, on the occasion of certain corporeal motions, our mind is to be capable of representing them to itself, for there is no similarity between these ideas and the corporeal motions. Is it possible to imagine anything more absurd than that all the common notions within our mind arise from such motions and cannot exist without them? I would like our author to tell me what the corporeal motion is that is capable of forming some common notion to the effect that 'things which are equal to a third thing are equal to each other', or any other he cares to take. For all such motions are particular, whereas the common notions are universal and bear no affinity with, or relation to, the motions. (CSM I, 304 305)

Rather similar ideas are developed at length by Cudworth.[116] He distinguished the essentially passive faculty of sense from the active and innate "cognoscitive powers" whereby men (and men alone) "are enabled to understand or judge of what is received from without by sense." This cognoscitive power is not a mere storehouse of ideas, but "a power of raising intelligible ideas and conceptions of things from within itself" (p. 425; Cudworth 1996: 75). The function of sense is "the offering or presenting of some object to the mind, to

give it an occasion to exercise its own activity upon." Thus, for example, when we look into the street and perceive men walking, we are relying, not merely on sense (which shows us at most surfaces – i.e., hats and clothes – and, in fact, not even objects), but on the exercise of the understanding, applied to the data of sense (pp. 409–410; Cudworth 1996: 57–59).[117] The "intelligible forms by which things are understood or known, are not stamps or impressions passively printed upon the soul from without, but ideas vitally protended or actively exerted from within itself." Thus prior knowledge and set play a large role in determining what we see (e.g., a familiar face in a crowd) (pp. 423–424; Cudworth 1996: 74). It is because we use intellectual ideas in perception "that those knowledges which are more abstract and remote from matter, are more accurate, intelligible and demonstrable, – than those which are conversant about concrete and material things," as Aristotle has observed (p. 427; Cudworth 1996: 78).[118] This claim is illustrated by a discussion of our conceptions of geometrical figures (pp. 455f.; Cudworth 1996: 103ff.). Obviously every sensed triangle is irregular, and if there were a physically perfect one, we could not detect this by sense; "and every irregular and imperfect triangle [is] as perfectly that which it is, as the most perfect triangle." Our judgments regarding external objects in terms of regular figures, our very notion of "regular figure" therefore have their source in the "rule, pattern and exemplar" which are generated by the mind as an "anticipation." The concept of a triangle or of a "regular proportionate and symmetrical figure" is not taught but "springs originally from nature itself," as does, in general, the human concept of "pulchritude and deformity in material objects"; nor can the a priori truths of geometry be derived from sense. And it is only by means of these "inward ideas" produced by its "innate cognoscitive power" that the mind is able to "know and understand all external individual things" (p. 482; Cudworth 1996: 101–128 *passim*).

Descartes had discussed the same question in very similar terms, in his *Reply to Objections V*:

> Hence, when in our childhood we first happened to see a triangular figure drawn on paper, it cannot have been this figure that showed us how we should conceive of the true triangle studied by geometers, since the true triangle is contained in the figure only in the way in which a statue of Mercury is contained in a rough block of wood. But since the idea of the true triangle was already in us, and could be conceived by our mind more easily than the more composite figure of the triangle drawn on paper, when we saw the composite figure we did not apprehend the figure we saw, but rather the true triangle. (CSM II, 262)

For Cudworth, the interpretation of sensory data in terms of objects and their relations, in terms of cause and effect, the relations of whole and part, symmetry, proportion, the functions served by objects and the characteristic uses to which they are put (in the case of all "things artificial" or "compounded natural things"), moral judgments, etc., is the result of the organizing activity of the

mind (pp. 433f.; Cudworth 1996: 83–100). The same is true of the unity of objects (or, for example, of a melody); sense is like a "narrow telescope" that provides only piecemeal and successive views, but only the mind can give "one comprehensive idea of the whole" with all its parts, relations, proportions, and Gestalt qualities. It is in this sense that we speak of the intelligible idea of an object as not "stamped or impressed upon the soul from without, but upon occasion of the sensible idea excited and exerted from the inward active and comprehensive power of the intellect itself" (p. 439; Cudworth 1996: 91).[119]

Ideas of this sort regarding perception were common in the seventeenth century but were then swept aside by the empiricist current, to be revived again by Kant and the romantics.[120] Consider, for example, Coleridge's remarks on active processes in perception:

> Instances in which a knowledge given to the mind quickens and invigorates the faculties by which such knowledge is attainable independently cannot have escaped the most ordinary observer, and this is equally true whether it be faculties of the mind or of the senses … It is indeed wonderful both how small a likeness will suffice a full apprehen sion of sound or sight when the correspondent sound or object is foreknown and foreimagined and how small a deviation or imperfection will render the whole confused and indistinguishable or mistaken where no such previous intimation has been received. Hence all unknown languages appear to a foreigner to be spoken by the natives with extreme rapidity and to those who are but beginning to understand it with a distressing indistinction.[121]

> Does nature present objects to us without exciting any act on our part, does she present them under all circumstances perfect and as it were ready made? Such may be the notion of the most unthinking … not only must we have some scheme or general outline of the object to which we could determine to direct our attention, were it only to have the power of recognizing it …[122]

It is, once again, with Humboldt that these ideas are applied most clearly to the perception and interpretation of speech. He argues that there is a fundamental difference between the perception of speech and the perception of unarticulated sound (cf. note 38). For the latter, "an animal's sensory capacity" would suffice. But human speech perception is not merely a matter of "mere mutual evocation of the sound and the object indicated" (*Verschiedenheit*, p. 70; Humboldt 1999: 57). For one thing, a word is not "an impression of the object in itself, but rather of its image, produced in the soul" (p. 74). But, furthermore, speech perception requires an analysis of the incoming signal in terms of the underlying elements that function in the essentially creative act of speech production, and therefore it requires the activation of the generative system that plays a role in production of speech as well, since it is only in terms of these fixed rules that the elements and their relations are defined. The underlying "rules of generation" must, therefore, function in speech perception. If it were not for its mastery of these, if it were not for its ability "to actualize every

possibility" the mind would no more be able to deal with the mechanisms of articulated speech than a blind man is able to perceive colors. It follows, then, that both the perceptual mechanisms and the mechanisms of speech production must make use of the underlying system of generative rules. It is because of the virtual identity of this underlying system in speaker and hearer that communication can take place, the sharing of an underlying generative system being traceable, ultimately, to the uniformity of human nature (cf. pp. 101–102 above and note 115). In brief,

> There can be nothing present in the soul, save by one's own activity, and understanding and speaking are but different effects of this power of speech. Conversing together is never comparable with a transfer of material. In the understander, as in the speaker, the same thing must be developed from the inner power of each; and what the former receives is merely the harmoniously attuning stimulus … In this way language in its entirety resides in every human being, which means, however, nothing else but that everyone possesses an urge governed by a specifically modified, limiting and confining power, to bring forth gradually the whole of language from within himself, or when brought forth to understand it, as outer or inner occasion may determine.
>
> But understanding could not, as we have just found, be based upon inner spontaneity, and communal speech would have to be something other than mere mutual arousal of the hearer's speech capacity, did not the diversity of individuals harbor the unity of human nature, fragmented only into separate individualities. (p. 70; Humboldt 1999: 57 [with modifications])

Even in the case of perception of a single word, an underlying system of generative rules must be activated. It would be inaccurate, Humboldt maintains, to suppose that speaker and hearer share a store of clear and totally formed concepts. Rather, the perceived sound incites the mind to generate a corresponding concept by its own means:

> [People] do not understand one another by actually exchanging signs for things, nor by mutually occasioning one another to produce exactly and completely the same concept; they do it by touching in one another the same link in the chain of their sensory ideas and internal conceptualizations, by striking the same note on their mental instrument, where upon matching but not identical concepts are engendered in each. (p. 213; Humboldt 1999: 152)

In short, speech perception requires internal generation of a representation both of the signal and the associated semantic content.

Contemporary research in perception has returned to the investigation of the role of internally represented schemata or models[123] and has begun to elaborate the somewhat deeper insight that it is not merely a store of schemata that function in perception but rather a system of fixed rules for generating such schemata.[124] In this respect too, it would be quite accurate to describe current work as a continuation of the tradition of Cartesian linguistics and the psychology that underlies it.

Summary

Returning to the remark of Whitehead's that initiated this discussion, it seems that after a long interruption, linguistics and cognitive psychology are now turning their attention to approaches to the study of language structure and mental processes which in part originated and in part were revitalized in the "century of genius" and which were fruitfully developed until well into the nineteenth century. The creative aspect of language use is once again a central concern of linguistics, and the theories of universal grammar that were outlined in the seventeenth and eighteenth centuries have been revived and elaborated in the theory of transformational generative grammar. With this renewal of the study of universal formal conditions on the system of linguistic rules, it becomes possible to take up once again the search for deeper explanations for the phenomena found in particular languages and observed in actual performance. Contemporary work has finally begun to face some simple facts about language that have been long neglected, for example, the fact that the speaker of a language knows a great deal that he has not learned and that his normal linguistic behavior cannot possibly be accounted for in terms of "stimulus control," "conditioning," "generalization and analogy," "patterns" and "habit structures," or "dispositions to respond," in any reasonably clear sense of these much abused terms. As a result, a fresh look has been taken, not only at language structure, but at the preconditions for language acquisition and at the perceptual function of abstract systems of internalized rules. I have tried to indicate, in this summary of Cartesian linguistics and the theory of mind from which it arose, that much of what is coming to light in this work was foreshadowed or even explicitly formulated in earlier and now largely forgotten studies.

It is important to bear in mind that the survey that has been presented here is a very fragmentary and therefore in some ways a misleading one. Certain major figures – Kant, for example – have not been mentioned or have been inadequately discussed, and a certain distortion is introduced by the organization of this survey, as a projection backwards of certain ideas of contemporary interest rather than as a systematic presentation of the framework within which these ideas arose and found their place. Thus similarities have been stressed and

divergences and conflicts overlooked. Still, even such a fragmentary survey as this does indicate, it seems to me, that the discontinuity of development in linguistic theory has been quite harmful to it and that a careful examination of classical linguistic theory, with its accompanying theory of mental processes, may prove to be an enterprise of considerable value.

Notes

INTRODUCTION TO THE THIRD EDITION

1 Juan Huarte near the end of the sixteenth century (see Chomsky's note 9) had remarked on linguistic creativity, but did not recognize its implications for the scientific study of mind in the way Descartes did.

The creativity that Chomsky is concerned with in *Cartesian Linguistics* is not that found in the sciences, for two reasons. One is that *Cartesian Linguistics* focuses on creativity in use, and scientists at work generally try to regulate the ways they use technical terms. This difference is significant; I comment on it below.

Second, *Cartesian Linguistics*' creativity rests on concepts already available typically innate. Scientific creativity involves the invention of new theories and, through them, new concepts. Chomsky's own scientific work is an example. He virtually created linguistics in its modern form when he abandoned the ill motivated project of descriptive taxonomy characteristic of much of linguistics when he began a project where the 'scientist' is, as Vaugelas in *Cartesian Linguistics* claims, "simply a witness" who cannot justify his or her descriptive 'tools' and initiated another project. That project consisted of constructing and improving what Chomsky now calls a "computational" science, a formal study of the biological 'mechanisms' by which languages are acquired and sentences put together.

2 In a debate with Michel Foucault on Dutch television in 1970 (in transcript form in Elders 1974: 143) Chomsky describes his interest in the texts of historical figures such as Descartes and Newton in this way: "I approach classical rationalism not really as a historian of science or … philosophy, but from the rather different point of view of someone who has a certain range of scientific notions and is interested in seeing how at an earlier stage people may have been groping towards these notions, possibly without even realizing what they were groping towards. …. One might say that I'm looking at history not as an antiquarian … interested in finding out and giving a precisely accurate account of what the thinking of the 17th century was I don't mean to demean that activity, it's just not mine but rather from the point of view of … an art lover who wants to look at the 17th century to find in it things that are of particular value and that obtain part of their value … because of the perspective with which he approaches them."

3 Descartes presents an interesting case. For anyone who wants to pursue the issue, Part III of this introduction focuses on his contributions. One of the puzzles: among his many contributions, Descartes offered the rudiments of a computational theory of vision. It is not obvious why he did not take the (limited, of course) success of this theory as an indication that various other mental operations might be captured by another kind of computational theory. The Port Royal grammarians who followed him

attempted to construct such a theory for language, and for their time made considerable progress.

4 Keep in mind here and throughout that the labels ‘rationalist’ and ‘empiricist’ are labels for specific views of the mind and of the best way to study the mind scientifically. Rationalists when they study the mind assume nativism and adopt internalism; empiricists are anti nativist and assume that the study of mind cannot proceed apart from study of how the environment in which a mind is found ‘shapes’ and gives specific content to the mind.

Historical and contemporary candidates for these labels can sometimes be difficult to place in one camp as opposed to another. While Hume, for example (usually classed as an empiricist), held that we get our higher level concepts and language through a process of learning that amounts to some form of associative grouping stabilized over time by repetition of similar experiences or “impressions” (clearly a general purpose learning mechanism), he also held that at least some of the operations of our mind seem to be performed automatically and in a remarkably rule like manner by “secret springs and principles.” He noted, for example, that humans seem to be able to comprehend any novel action and still make what look to be rule governed judgments about its permissibility. One way of reading the claim about secret springs and principles (and his refusal to try to say what they are) is to construe him as at heart a nativist (at least in certain domains), but one whose skepticism prevents him from undertaking a research project to figure out just what those internal springs and principles are. Jerry Fodor, on the other hand, is a self declared rationalist, and is indeed like other rationalists a nativist. But he adopts a non internalist view of mind and its study, as one would expect of someone who wants to think of the study of mind as the study of a representational (denoting, referring) system. Granted, he does not rely on a generalized learning procedure; but his RR credentials so far as my labeling conventions go are forfeit. Chomsky, though, is clearly in the RR camp: he is both nativist and rationalist, and with language and its use an opponent of the “representational theory of mind” that Fodor says is “the only game in town” if you want to be a cognitive scientist. Chomsky is also an even more vociferous opponent of empiricist “dogma” of their anti nativist and externalist view of the mind and their research strategy. Behaviorists among them, many philosophers still (although they might shun the label) are clearly in the empiricist camp. So too are many of the psychologists (and philosophers) who call themselves “connectionists.” Connectionism as it is practiced is primarily devoted to pressing the idea that with language and concepts (the complex ones, presumably) the mind gains its language producing shape and its conceptual contents by the operations of a generalized learning procedure. Their claim that the mind is made up of “neural nets” is innocuous; it is their claim about the initial state of the net (undifferentiated, approximating Locke’s “blank slate”) and their view about how this net gets its “content” (by training, learning) that place them firmly in the empiricist camp. It should surprise no one that a lot of connectionist work is directed to trying to show that some rule or another that is part of a RR theory might be “learned” by a neural net shaped by a generalized learning procedure involving “training.”

5 People (using what their minds provide) also put together clusters of sentences called “stories” or “tales” or “descriptions”, etc. depending on the job the cluster is supposed to perform. These are *not* under consideration here. Stories clearly are not

innate. Nor does one learn them. One has to have a language and construct sentences (complexes of concepts of sentential form) to be able to construct stories. The basic issue is how one acquires concepts and the combinatory principles involved in putting sentences together.

6 The RR theorist has no qualms about naturalistically determinate causal relations in the world head direction. Relations of this sort figure in an account of acquisition, not use.

7 Chomsky emphasized this quotation from Strawson (1950: 336) in a talk outlining and defending an internalist approach to semantics (meaning) at Harvard on October 30, 2007.

8 One can, of course, introduce a technical notion, *proper noun*, and stipulate that a *proper noun* denotes a single entity. Probably you will have to introduce a technical notion *entity* too. But you should not expect to convince an RR theorist aiming to construct a naturalistic theory of language and its meanings that s/he should take your technical terms seriously.

9 Keep in mind that talks and papers by philosophers and others provide contexts to a large extent under the control of the author or speaker and, unsurprisingly, those writing or speaking tend to construct contexts that suit what they want to defend.

10 Von Humboldt (discussed earlier in *CL* and again at its end) makes the same points as did Descartes, Cudworth, and others in the RR tradition.

11 Perhaps there is "hi?" But there is also "hey there," "hello," "greetings," "welcome," not to mention a current favorite among some, "dude." And none of these or any of the other possibilities for greeting terms or the few other cases where one can find some degree of regularity in use will sustain anything like Lewis's and Sellars's claims about conventions and practices, not to mention their semantic efforts.

12 Animal communication often displays something like relatively fixed uses of what their communication systems provide. But that fact if it is so has little or nothing to do with human use of natural languages, not to mention human language.

13 Chomsky and Marr call their theories "representational," but certainly in Chomsky's case and, I would argue, Marr's too this has nothing to do with the Fodorian notion of representation, which amounts to something like 're presentation'. Granted, we use vision often to navigate and otherwise deal with our immediate environments. That is only an occasional and insignificant aspect of our use of language. Yet neither theory is 'about' the world; each concerns what goes on in the head.

14 This needs qualification for science, as opposed to common sense. Science's con cepts seem to be inventions of human beings who construct theories. The point about 'the world' conforming to concepts remains, but in doing science, we hope that the concepts we construct with our theories offer a more objective (less anthropocentric) way to understand.

15 This is obvious with philosophers who think that what is in the head is the product of history, acculturation, or the like (Foucault, for example). And it is obvious in Sellars, Putnam, and even Quine. In case it is not obvious with the more experimentally inclined connectionists, consider the following excerpts from an article by Morris *et al*. (2000) describing the aim of their effort to get 'neural nets' (computer models of what they take neural nets to be) to "learn language," where languages are understood as communal forms of behavior, or "usage." They explain that children "learn

grammatical relations over time, and in the process accommodate to whatever language specific behaviors … [their] target language exhibits." Further: "From beginning to end this is a usage based acquisition system. It starts with rote acqui sition of verb argument structures, and by finding commonalities, it slowly builds levels of abstraction. Through this bottom up process, it accommodates to the target language."

16 Classifying Herder and Foucault among the empiricists will surprise some readers. Keep in mind that 'empiricism' as used here is a label for a research strategy concerning the human mind, one based on assumptions about the mind's contents and how they got there. Clearly, both Herder and Foucault are anti nativist and externalist in their views of language and how to study it. They are, then, empiricists, differing from others largely in a tendency to deny that natural science offers objective descriptions and explanations of world and at least some aspects of mind.

17 I assume a distinction between common sense and science or at the very least, the advanced mathematical sciences. The distinction goes back to Descartes, perhaps before. In his *Discourse* he contrasts the kind of study he is interested in (what we would now call natural science) and its methodology (which he helped clarify) to what one finds in "bon sens," sometimes (and plausibly) translated as "common sense." Chomsky adopts the distinction; it appears in much of his work. See his (1975a, 1988a, 1995a, 2000). Motivations for the distinction include the fact that children do not readily acquire scientific concepts and theories (although they may use sounds like "lepton") nor do they or any but those very familiar with the sciences routinely display scientific creativity. It is relevant too that scientists and mathematicians try to regulate their uses of technical terms when communicating with others in the field. Their uses of technical terms are much closer to what the empiricist seems to believe is the case with common sense concepts and their everyday use in natural languages.

18 That is perhaps true for physics, but not for study of the mind. Quine's "naturalized epistemology" holds that there are "causal" relations between sensory impingements and the beliefs and knowledge people develop about the world, where psychology is supposed to cash out these causal relations. But the story he tells about psychology in his naturalized epistemology material (Quine, 1969) seems to be little different from the view he develops of concepts, language, and world in his neglected 1974 *The Roots of Reference*. In that work, one finds standard empiricist claims about how psycho logical "causal" relations come to be established: with the exception of some "sali encies" found in sensory systems, causal relationships are under exogenous control. This is not 'naturalizing' the study of mind it is not treating the mind as a natural object that grows according to a biophysical agenda and using the tools of naturalistic research to understand it. As for Sellars, his (1960, among others) simply assumes that the science of mind (psychology, I presume) is behaviorism, and he explicitly adopts an early version of the connectionists' view of the brain and its 'learning'. He does gesture in the direction of evolution for bee languages a naïve version of evolution, at least. But he shows no inclination to extend what he says there to human language. That would have the effect of separating language from "reason," which he takes to be ours by virtue of learning language. It would detach what he took to be the epistemic norms of reason from their 'home' in the linguistic community. Chomsky's idea of studying language (including its meanings) apart from the use of language did not occur to him, or obviously to many other philosophers and cognitive scientists.

19 The term is due to Elman, one of the more famous and productive connectionists.
20 The preface Chomsky added to a 1967 reprint of his 1959 review of the behaviorist B. F. Skinner's *Verbal Behavior* remains apropos. "I had intended this review not specifically as a criticism of Skinner's speculations regarding language, but rather as a more general critique of behaviorist (I would now prefer to say 'empiricist') speculations as to the nature of higher mental processes. My reason for discussing Skinner's book in such detail was that it was the most careful and thoroughgoing presentation of such speculation… Therefore, if the conclusions I attempted to substantiate in the review are correct, as I believe they are, then Skinner's work can be regarded as, in effect, a reductio ad absurdum of behaviorist [and empiricist] assumptions. My personal view is that it is a definite merit, not a defect, of Skinner's work that it can be used for this purpose, and it was for this reason that I tried to deal with it fairly exhaustively. I do not see how his proposals can be improved upon, aside from occasional details and oversights, with the framework of the general assumptions that he accepts. I do not, in other words, see any way in which his proposals can be substantially improved within the general framework of behaviorist or neobehaviorist, or, more generally, empiricist ideas that has dominated much of modern linguistics, psychology, and philosophy. The conclusion that I hoped to establish in the review, by discussing these speculations in their most explicit and detailed form, was that the general point of view is largely mythology, and that its widespread acceptance is not the result of empirical support, persuasive reasoning, or the absence of a plausible alternative." (1959/1967: 142)
21 The scare quotes are justified. The connectionists' neural nets are computers made to simulate not what one actually finds in the case of actual neural nets very complex forms of interconnected neurons that develop under genetic control to provide the organism with cognitive and other systems that are more or less the same across the human population. They are made to simulate Locke's blank slate.
22 'Generative' can mean (and often does mean in *CL*, and certainly did for the Port Royalists) 'productive', generally understood to require some recursive princi ples to allow for infinite competence, given human finite means. In more technical formal work, it means (or perhaps means also) 'explicit' or 'formal'.
23 Note that this measure of 'better than' explicitly relies on a technical sense of simplicity. Simplicity, as mentioned before, is another desideratum of science. The fate of the notion of simplicity in Chomsky's work its beginnings in the work of his teacher Nelson Goodman, its varieties in Chomsky's work, and its extraordinarily important role in "minimalism" is a fascinating study in itself, but unfortunately it is beyond the scope of this introduction.
24 It is possible he dealt with such matters in the final volume of *Le Monde*. He destroyed that work when he heard of Galileo's fate, however, so we will never know.
25 Descartes held that animals are machines that their actions are determined by external stimulus and inner state, and can be understood by using a deterministic contact mechanics (which includes a mechanical interpretation of neurophysiologi cal function). We know he was wrong to think of them this way, but his test applies in any case.
26 The test itself has obvious limitations. There are cases where, due to trauma or disease, people who demonstrated normal linguistic competence at one time become (perhaps temporarily) incapable of expressing language at all. An obvious if trivial

example is a normal speaking person who has had a throat operation and cannot speak. There are other kinds of cases too, some of them extremely interesting from a scientist's point of view because they reveal novel features of human language and mind. Still, Descartes's test for mind is the best easily applied test anyone has come up with, and it takes no special skills or knowledge to apply. In only a slightly different form, Alan Turing reinvented Descartes's test and suggested trying it out on programmable machines. He optimistically and incorrectly predicted that it would be possible to program a computer to pass it by the year 2000. Some of his other points are worthwhile, however, and his 1950 *Mind* paper "Computing Machinery and Intelligence" bears closer reading than it often receives. One of the more important of those insights, usually ignored, is that if a machine does pass the test, no fact of the matter has been determined; no scientific issue is resolved. The test offers no evidence in favor of a specific science of mind, and it does *not* show that the mind works the way the computer that passes the test does (any more than Big Blue's win at chess shows that the human chess player's mind works that way). All that is claimed to follow is that success might offer a reason to *decide* whether to *say* that a machine thinks to decide whether to change one's use of language and say that machines think (now often done anyway, without satisfying anything as strict as Turing's test). For the naturalistic scientist of mind, this is about as interesting a question as whether excavators really do dig, or whether submarines swim. Usage as linguistic creativity reveals can vary, but with no consequence for (in this case) the naturalistic science of fish or the hydraulic systems of excavators.

The significance of the test for Chomsky is quite different and more in line with another of Turing's aims: "investigating the intellectual capacities of man." The test (or rather, failure to pass it in the unrestricted case contemplated by Descartes) provides a reason to strongly suspect that some problems here, constructing a science of the creative aspect of language use are beyond the reach of human intelligence. And it underscores a basic assumption of RR research strategy: one should proceed on the assumption that there might well be limits to our science's capacity to deal with human behavior behavior that to all appearances seems to be free. The biolinguist *expects* limitations on human problem solving capacities (both common sense and scientific). We are, after all, natural biological organisms. See Chomsky 1988, ch. 5.

Note that the significance of the test for Descartes, Cordemoy, and others in the seventeenth century was rather different; it was then clearly relevant to the principles of physical science as understood at the time and it suggested what seemed then to be a plausible hypothesis concerning how to deal with it: creativity must be due to a different principle, lodged in a non bodily "substance." Introducing mental sub stance to lodge a principle of creativity was for them then just doing what we would think of now as 'normal science'. It was proposing a scientific solution to a scientific problem.

Nothing came of Descartes's proposed solution to the problem, obviously. Apparently, science still cannot deal with the matter, even though science including the science of mind has changed very considerably since Descartes's time. Perhaps we should reintroduce a distinction Chomsky introduced (in Chomsky 1975a): if there is no known or even remotely plausible solution to a problem, in spite of many efforts to contend with it, it is not a problem but a mystery.

27 The language faculty does not actually *do* anything, of course. People do things. But, having it, people can do things (produce apparently endless numbers of sentences) at will. This point is part of what Chomsky is after in insisting that his is a theory of linguistic *competence*, not performance.

28 The attractions of a contact mechanics its apparently obvious character, probably due to the common sense observation that to move a chair, you must come into contact with it continued to keep Newton in its grip. He even spoke of action without contact as "absurd," and tried to save contact mechanics by introducing a "subtle aether," making various odd looking moves to justify this effort. Contact mechanics continues its grip. It is hard to find any explanation for why contemporary philosophers who exercise themselves over a mind body problem apparently con tinue to assume that Descartes was right about "body." See below.

29 In recent talks and papers (Chomsky, forthcoming), Chomsky points out that philos ophers tend now to focus on quite a different issue. This is an issue raised many years ago by Bertrand Russell with his example of a blind physicist who had a good understanding of the causal structure of the universe, but who could not experience blue: does a complete science of the universe leave out experience as it is undergone? Russell's answer (or at least one of his answers) is, in essence, that physics aims towards an objective theory of the "causal skeleton of the world," and because it does, and introduces formal tools to succeed it cannot deal with everything, only those matters that the tools of science can reach. Given this, it is hardly surprising that the predominantly anthropocentric aspects of the world of experience are outside of science's reach (although see the second paragraph below). Science is limited by its aim and by the tools that allow for success in carrying out its task. (And everyday experience and the common sense concepts we use to configure and understand it are hopeless as science too, of course; they too have their limitations.)

Putting the issue in Russell's way focuses matters in a way that improves, I think, on the way the discussion often goes in recent work wondering whether science can deal with experiencing red, speculating about whether we can know "what it is like to be a bat" (weasel, octopus…), and the like. Russell focuses discussion not on differences between third person and first person understandings in various domains, but on human cognitive capacities and the tools that they provide. This focus on capacities and the tools available for exercising them not only makes it clear that there are substantial differences between what science and common sense provide, but it points to the fact that whatever we have, we have it as biological creatures. *Any* cognitive capacities we have are limited, and limited in specific, and different, ways. Common sense has an anthropocentric focus and is comfortable with linguistic creativity. It relies heavily on native conceptual tools and on the extraordinary combinatory power offered humans by a system that allows us to put together arbitrarily chosen concepts. Because both come 'for free', common sense allows for highly flexible use at an early age flexibility that is exploited all the time, as we have seen. But common sense proves useless at providing genuinely objective anthropocentric free descriptions and explanations. That is the task of science, a project that (as we have seen) is uncomfort able with 'ordinary' linguistic creativity and that succeeds where there is very consid erable agreement on how to use the symbols characteristic of a particular science. Apparently, we have at least two ways of 'cognizing' the world and ourselves. Neither can do the other's job. And both have the characters they do because each is

biologically based although this is less obvious in the case of science formation (for arguments that it is biologically based, see Chomsky 1980/2005).

It is instructive to look at one of the issues that philosophers discuss from this point of view. Consider the matter of qualia. A philosopher might claim that having an experience of red counts as an essentially mental occurrence, out of the reach of 'physical' science. But it is easy to see that its distinctively mental character proves elusive. The best existing attempts to say what 'equipment' one needs to have such an experience point in the direction of being a biological creature with certain kinds of biophysical equipment. There is little help for a distinct mental domain there. And if asked to describe an experience of red, one would be hard pressed using the terminol ogy of natural languages (as opposed to philosophers' shop talk terminology of 'qualia') to do more than say that you see something red over there which attributes redness to something 'over there' and presumably outside the head, not to some mental event. Ironically, a computational theory of the vision faculty does a better job of making it clear that color (or more technically, a combination of hue, brightness, and saturation) lies in the mind/brain than does common sense or philosopherese. The irony becomes even more apparent when one is asked to describe the experience. Natural languages typically take colors to be properties of surfaces of objects 'out there', and color terms ('red', 'yellow', 'green', 'blue'…) are very limited. If one wants a precise description of a color *experience*, the terminology of hue, brightness, and saturation (which would need to be supplemented to deal with some colors (such as brown and fluorescent colors) that involve other aspects of a theory of color) attributed to retinotopic visual expanses is much better: this clearly locates colors (and even positions) in the head, and offers as precise a specification of color as one is likely ever to need. 'Mentalists' about color qualia would do far better with the 'third person' terminology of the sciences than the 'first person' terminology of experience. As for 'physicalists', their view of the nature of body is typically Cartesian as the text indicates. But that conception of body was abandoned by physicists centuries ago. So the points made here hardly indicate that physicalism 'wins'.

30 He observed that given what his optics revealed about the eye, the retina, and light properties of the signal, the retina, and of the eyeballs themselves can at best correlate with 'what one sees' with colored, shaped visual fields, and the sensation of depth that partially constitutes these fields. These various "movements" of eyeball, etc., which act upon our "soul" clearly do not *resemble* the mental qualities sensed ("light, colour, position, distance [depth], size and shape"); rather, nature "ordains… [that the movements make the soul] have such sensations" (CSM I: 167). He could have done the same with sound: tympanic vibrations correlate with, for example, a heard brilliant high E. Or with touch, etc.

31 In comments on a draft of this introduction, Chomsky pointed out to me that Descartes had made some visual poverty observations that invited maintaining that Euclidean geometry is innate to the mind. In effect, he not only made poverty observations, but he understood that they demanded an explanation by recourse to a theory/science of what the mind brings to experience. Chomsky remarks, "To my knowledge, [Descartes] is the first to have clearly stated the problem of poverty of stimulus, in his passage in the *Dioptrics* about how an infant on first seeing a figure will interpret it as a distorted triangle, not as a perfect instance of whatever crazy figure it is, which seems only a step away from postulating that something like

Euclidean geometry is innate [to the human mind] and provides the framework for perception, on poverty of stimulus grounds."

32 See David Marr's 1982 *Vision* for an early and still very impressive account. His view of color processing is by no means state of the art, and a lot has gone on since the book's appearance in the early 1980s in other areas of vision. But his view of how to proceed remains a paradigm.

33 An I language is something like a specific person's idiolect. More carefully, it is a language that is individual, internal, and intensional. The first two terms 'individual' and 'internal' are self explanatory. To say that an I language is intensional is to say that it is specified "under intension" in effect, you have to have a theory of language in order to say what it is. Or to put it another way, a language is an intensional function: take a list of lexical items and specify the combinatory principles/functions; together, these determine the possible sentences of a language. In practice, assuming that the combinatory principles of a person's language faculty are in a known steady state, one can specify an I language by listing a person's lexical entries.

34 Could he have had in mind not sensation of (say) a color or depth sort, but judgment thereof? That would, on his own grounds, involve more than what the visual (or for the blind, touch) system can provide. Against this is that he clearly holds that colors and sounds are mental and innate to the mind, and are distinct from the "movements" of sensory equipment.

35 An early reference is found in reprinted form in his *Towards a New Cold War* (1982): 64. He sometimes calls intellectuals (responsible ones excepted) members of a secular priesthood. Where priests are supposed to mediate between a deity and the human beings who need to be told what they should and should not do and justify the authority of the deity, members of a secular priesthood mediate between a different kind of authority to explain and justify to the ignorant the considerably less than obvious principles of the "state religion." In the US and other capital dominated systems currently, the state religion is a form of neoliberal or neoconservative faith in "free markets," "free trade," and other supposed miracles of the marketplace that are thought to somehow justify massive economic and political inequalities. The eighty percent or so of the US population who lack a managerial position seem to need considerable guidance in this matter, for these "rabble" must be kept in line. Note that Chomsky includes among these intellectuals the personnel of major corporate run media institutions TV, newspapers, etc. The propaganda model of media perform ance that he and Edward Herman constructed to explain these intellectuals' actions nicely predicts how they filter and skew what they write about, and how they present information. Their hypothesis is that while corporate run media personnel may engage in internal dispute about whether they are not perhaps too liberal, they will never question the articles of the secular faith, and will frame the information they provide their audiences in ways that advances these articles. The hypothesis's success at prediction (detailed by Chomsky and Herman, and Chomsky alone [in Chomsky 1988b]) shows that they must be near the mark.

CARTESIAN LINGUISTICS

1 M. Grammont, *Revue des langues romanes* 60 (1915), p. 439. Quoted in G. Harnois, "Les théories du langage en France de 1660 à 1821," *Études françaises* 17 (1929).

Harnois in essence agrees, holding that earlier linguistics hardly merits the name "science" and that he is engaged in a "history of linguistics before there was a linguistics." Similar views have been widely voiced.

2 By a "generative grammar" I mean a description of the tacit competence of the speaker hearer that underlies his actual performance in production and perception (understanding) of speech. A generative grammar, ideally, specifies a pairing of phonetic and semantic representations over an infinite range; it thus constitutes a hypothesis as to how the speaker hearer interprets utterances, abstracting away from many factors that interweave with tacit competence to determine actual performance. For recent discus sion, see Katz and Postal, *An Integrated Theory of Linguistic Descriptions* (Cambridge: M.I.T. Press, 1964); Chomsky, *Current Issues in Linguistic Theory* (The Hague: Mouton, 1964); *Aspects of the Theory of Syntax* (Cambridge: M.I.T. Press, 1965). [Terminology related to "competence" includes "core grammar" (Chomsky, 1981). The distinction between competence and performance can be seen as a distinction between language and its use; it appears in Chomsky's work in various forms. The literature is enormous. Restricting the list to a few of Chomsky's representative works alone, see Chomsky 1975a, 1980, 1981, 1986, 1988a, 1995, and 2000. Among these, 1975a, 1980, 1988a, and 2000 are more accessible to general audiences than the others. For useful additional discussion, see Smith 1999.]

3 Nor should it be assumed that the various contributors to what I will call "Cartesian linguistics" necessarily regarded themselves as constituting a single "tradition." This is surely not true. With the construct "Cartesian linguistics," I want to characterize a constellation of ideas and interests that appear in the tradition of "universal" or "philo sophical grammar," which develops from the Port Royal *Grammaire générale et raisonnée* (1660); in the general linguistics that developed during the romantic period and its immediate aftermath; and in the rationalist philosophy of mind that in part forms a common background for the two. That universal grammar has Cartesian origins is a commonplace; Sainte Beuve, for example, refers to the Port Royal theory of grammar as "a branch of Cartesianism that Descartes himself had not developed" (*Port Royal*, vol. III, 1860, p. 539). An association of the general linguistics of the romantic period to this complex is less immediately obvious, but I will try to show, nevertheless, that some of its central features (and, furthermore, those which seem to me to constitute its most valuable contribution) can be related to Cartesian antecedents.

By discussing romantic theories of language and mind within this framework, I am forced to exclude other important and characteristic aspects of these theories; for example, the organicism that was (rightly or wrongly) taken to be a reaction against Cartesian mechanism. In general, it must be emphasized that my concern here is not with the transmission of certain ideas and doctrines, but with their content and, ultimately, their contemporary significance.

A study of this sort could profitably be developed as part of a more general inves tigation of Cartesian linguistics as contrasted with a set of doctrines and assumptions that might be referred to as "empiricist linguistics" and illustrated by modern structural and taxonomic linguistics as well as by parallel developments in modern psychology and philosophy. I will not attempt to develop this distinction any more fully or clearly here, however.

4 It should be borne in mind that we are dealing with a period that antedates the divergence of linguistics, philosophy, and psychology. The insistence of each of

these disciplines on "emancipating itself" from any contamination by the others is a peculiarly modern phenomenon. Again, current work in generative grammar returns to an earlier point of view, in this case, with respect to the place of linguistics among other studies.

5 He leaves open, as beyond the limitations of human reason, the question whether the explanatory hypotheses that he proposes are the "correct" ones in any absolute sense, limiting himself to the claim that they are adequate, though obviously not uniquely so. Cf. *Principles of Philosophy*, pt. IV, art. CCIV.

The context of this discussion of the limits of mechanical explanation must be kept clearly in mind. The issue is not the existence of mind, as a substance whose essence is thinking. To Descartes, this is obvious from introspection more easily demonstrated, in fact, than the existence of body. What is at stake is the existence of other minds. This can be established only through indirect evidence of the sort that Descartes and his followers cite. These attempts to prove the existence of other minds were not too convincing to contemporary opinion. Pierre Bayle, for example, characterizes the presumed inability of the Cartesians to prove the existence of other minds "as perhaps the weakest side of Cartesianism" (art. "Rorarius," in Bayle's *Dictionnaire historique et critique* (1697); *Historical and Critical Dictionary*, trans. R. Popkin (Indianapolis: Bobbs Merrill, 1965), p. 231).

6 *Discourse on the Method*, pt. V. [In *The Philosophical Writings of Descartes*, trans. J. Cottingham, R. Stoothoff and D. Murdoch, 2 vols. (Cambridge: Cambridge University Press, 1984 5), abbreviated CSM I, CSM II.]

In general I will use English translations where these and the original are readily available and will cite the original otherwise, if available to me. In citing original sources, I will occasionally regularize spelling and punctuation slightly.

7 For some recent views and evidence on this question, see E. H. Lenneberg, "A Biological Perspective of Language," in *New Directions in the Study of Language*, ed. E. H. Lenneberg (Cambridge: M.I.T. Press, 1964). [The literature is now massive. For a popular discussion of some issues, see Pinker 1995; Pinker and Chomsky do not, however, agree on the issue of the evolution of language. Jenkins 2000 has a clear and general but more technical discussion of some of Chomsky's views on the topic. In a related vein, Chomsky often now refers to formal work on morphogenesis by Alan Turing and D'Arcy Thompson, and has suggested speculatively at this stage that perhaps language 'evolved' as a consequence of what happens to physical and bio logical processes when placed in a specific and complex form of organism. This is not evolution as popularly conceived, where it is supposed that evolution amounts to some kind of natural selection that yields reproductive advantages. This usual conception of evolution is generally assumed to require many millennia in order to produce a complex system; it also bears a remarkable resemblance to behaviorism, a fact noted by Skinner. It may not even be Darwinian; often, it assumes a Lamarckian cast.

Recent linguistic work within the minimalist project (post 1990s) has opened up the possibility that language (specifically, competence, or what is now seen as a 'narrow' conception of language (FLN: the faculty of language, narrow) that focuses on the linguistic 'core' (also "narrow syntax") is in fact very simple, amounting perhaps to nothing more than recursion or the operation Merge. This also makes the introduction of language at a single step a realistic possibility. Assuming that what happens with regard to the production of sounds or the interpretation of semantic 'features' is

already in place, it would be enough if a single mutation took place in a single member of the species homo, where that mutation introduced Merge and was genetically transmissible. Having recursion allows for *n* word sentences (more interestingly, *n* concept meanings), offering extraordinary advantages to members of a group that had the relevant gene(s). The introduction of language at a single step also makes sense of the fact that sometime between 50 and 100 thousand years ago, humans began to develop art and religion (a form of explanation, after all), organize themselves into different forms of social system, observe the stars and seasons, develop agriculture, and so on. The great migration from Africa began about this time too. This all makes sense if it was during this period that language came to be introduced, a period that is very short in evolutionary time.]

8 Obviously, the properties of being unbounded and being stimulus free are independent. An automaton may have only two responses that are produced randomly. A tape recorder or a person whose knowledge of a language extends only to the ability to take dictation has an unbounded output that is not stimulus free in the intended sense. Animal behavior is typically regarded by the Cartesians as unbounded, but not stimulus free, and hence not "creative" in the sense of human speech. Cf., for example, Francois Bayle, *The General System of the Cartesian Philosophy* (1669) (English translation 1670, p. 63): "And because there may be an infinite variety in the impressions made by the objects upon the senses, there may also be an innumerable variety in the determination of the Spirits to flow into the Muscles, and by consequence, an infinite variety in the Motions of Animals; and that the more, because there is a greater variety of parts, and more contrivance and art in the structure." The unboundedness of human speech, as an expression of limitless thought, is an entirely different matter, because of the freedom from stimulus control and the appropriateness to new situations.

It is important to distinguish "appropriateness of behavior to situations" from "control of behavior by stimuli." The latter is characteristic of automata; it is the former that is held to be beyond the bounds of mechanical explanation, in its full human variety.

Modern studies of animal communication so far offer no counterevidence to the Cartesian assumption that human language is based on an entirely distinct principle. Each known animal communication system either consists of a fixed number of signals, each associated with a specific range of eliciting conditions or internal states, or a fixed number of "linguistic dimensions," each associated with a nonlinguistic dimension in the sense that selection of a point along one indicates a corresponding point along the other. In neither case is there any significant similarity to human language. Human and animal communication fall together only at a level of generality that includes almost all other behavior as well. [Studies since 1966 continue to indicate that there is no counterevidence. Studies also show that unless humans are given at least a minimal amount of experience of the relevant kind (hearing or seeing language spoken or signed by others, for example) before a certain critical stage, they cannot acquire full linguistic competence. See, among others, the study of Genie in Curtiss 1976.

I (the ed.) emphasize the special status of appropriateness in the creative aspect of language use in the new introduction to this third edition. Recursion can make sense of innovation or the unbounded characteristics of language, and at a stretch a randomizing element could deal with stimulus freedom. So a computer program might allow for

both. But there is no obvious way to make sense of appropriateness while meeting the other two. It has proven impossible so far and may always prove so to meet all three conditions of being linguistically creative.]

9 In general, then, "although machines can perform certain things as well as or perhaps better than any of us can do, they infallibly fall short in others, by the which means we may discover that they did not act from knowledge, but only from the disposition of their organs." There are, then, two "very certain tests" by which we can determine whether a device is really human, the one provided by the creative aspect of language use, the other, by the diversity of human action. "It is virtually impossible" (in the Haldane Ross translation, "morally impossible") "that there should be sufficient diversity in any machine to allow it to act in all the events of life in the same way as our reason causes us to act." In taking this position, Descartes expands on his conception of the "cognitive power" as a faculty which is not purely passive and which is properly called "native intelligence [*ingenium*]" when it " forms new ideas in the corporeal imagination, or concentrates on those already formed," acting in a way that is not completely under the control of sense or imagination or memory (*Rules for the Direction of the Mind* (1628); CSM I, 42). Still earlier, Descartes remarks that "the high degree of perfection displayed in some of their actions makes us suspect that animals do not have free will" ("Olympian Matters" c.1620; CSM I, 5).

The idea that the "cognitive power" is properly called "mind" only when it is in some sense creative has earlier origins. One source that might well have been familiar to Descartes is Juan Huarte's *Examen de Ingenios* (1575), which was widely translated and circulated (I quote from the English translation by Bellamy, 1698). Huarte understands the word *Ingenio* to have the root meaning "engender," "generate" he relates it to *gigno, genero, ingenero* (p. 2). Thus "one may discover two generative Powers in Man, one common with the Beasts and Plants, and the other Participating of Spiritual Substances, God and the Angels" (p. 3). "Wit [*Ingenio*] is a generative power … the Understanding is a Generative Faculty" (p. 3). As distinct from divine "Genius," the human "rational soul" and "spiritual substances" do not have "sufficient Force and Power in their Generation to give real being to what they Ingender" but only "to produce an accident in the Memory," "an Idea and Image of what we know and understand" that must be given concrete existence by work and art (pp. 4 5). Similarly the arts and sciences are "a sort of Images, and Figures, begotten by [men's] Minds in their Memory, which represent to the Life the Posture and natural Composition of the Subject relating to the intended Science" (p. 6). One who learns some subject must "Engender within himself an entire and true Figure" that represents its principles and structure (p. 6). Truly active minds will be "such, that assisted by the subject only, [they will] without the help of any Body, produce a thousand Conceits they never heard spoke of" (p. 7). The empiricist maxim, "That there is nothing in the Understanding, but what has past through the Sense," attributed to Aristotle, applies only to "docile wits" that lack this capacity. Although the "perfect wit" is only an ideal case, "yet it must be granted, we have observ'd many Persons approach very near it, inventing and saying such things as they never heard from their Masters, nor any Mouth" (p. 16). There is even a third kind of wit "by means of which, some have without Art or Study spoke such subtle and surprizing things, and yet true, that were never before seen, heard, or writ, no nor ever so much as thought of" and which may involve "a mixture of Madness" (p. 17); these three types of wit involve the memory,

understanding, and imagination, respectively. In general, "all [man's] Honour and Nobility, as *Cicero* observed, consists in his being favour'd with, and having an Eloquent Tongue: *As Wit is the Ornament of a Man, so Eloquence is the Light and Beauty of Wit*. In this alone he distinguishes himself from the Brutes, and approaches near to God, as being the greatest Glory which is possible to be obtained in Nature" (p. 22). The most severe "disability of wit," under which men "differ not at all from Brute Beasts," is the disability, which "very much resembles that of Eunuchs … unable for Generation," that prevents the rational faculty from arriving at "the first Principles of all Arts implanted in the Scholar's Mind, before he begin to learn, for which the Wit can give no other proofs of itself, than to receive them as things already known; and if he be not able to form an Idea of them in his Mind, we may strongly conclude him wholly incapable of the Sciences." In this case, "neither the Lash of the Rod, nor his Cries, nor Method, nor Examples, nor Time, nor Experience, nor any thing in Nature can sufficiently Excite him to bring forth any thing" (pp. 27 28).

See K. Gunderson, "Descartes, La Mettrie, Language and Machines," *Philosophy* 39 (1964), pp. 193 222, for an interesting discussion of Descartes's arguments as related to contemporary discussions of "intelligence" of automata. For general background on the development and critique of Descartes's theory of the extent and limits of mechanical explanation, see Rosenfield, op. cit., and H. Kirkinen, "Les origines de la conception moderne de l'homme machine," *Annales Academiae Scientiarum Fennicae*, ser. B, vol. 22, Helsinki (1961).

10 Translated (in part) in H. A. R. Torrey, *The Philosophy of Descartes* (New York: Holt, 1892), pp. 281 284. [The translation that appears here, and in all subsequent quotations from Descartes's correspondence, is from *The Philosophical Writings of Descartes*, vol. III: *The Correspondence*, trans. J. Cottingham, R. Stoothoff, D. Murdoch and A. Kenny (Cambridge: Cambridge University Press, 1991) (abbre viated CSMK).]

11 That is, by conditioning. When animals are taught "by art," their actions are produced with reference to a passion, in the sense that this behavior is associated with the "stir of expectation of something to eat" or the "motions of their fear, their hope, or their joy" that constitute the original contingency for the teaching. Descartes is therefore pointing out that, just as in its normal use "verbal behavior" is free of identifiable external stimuli or internal physiological states, so it is evidently not developed in the individual by conditioning. He does not elaborate on this, regarding it perhaps as too obvious to merit discussion. It is noteworthy that modern behaviorist speculation about human learning denies these truisms. For some discussion, see Chomsky, "Review of Skinner, 'Verbal Behavior,'" *Language* 35 (1935), pp. 26 58; *Aspects of the Theory of Syntax*, chap. I, §8; J. Katz, *Philosophy of Language* (New York: Harper & Row, 1966); J. Fodor, "Could Meaning be an 'r_m'" *Journal of Verbal Learning and Verbal Behavior* 4 (1965), pp. 73 81. [For useful contemporary discussion of organisms' modular learning and its explanation, see Gallistel 1990, 2002. Chomsky has in recent years referred approvingly to Gallistel's work. For a fascinating study of linguistic modu larity in a polyglot savant, see Smith and Tsimpli 1995.]

12 The Descartes More correspondence, in so far as it relates to animal automatism, is translated in full by L. C. Rosenfield (L. Cohen) in the *Annals of Science* 1 (1936) [and in CSMK].

13 Descartes goes on to explain that he does not deny to animals life or sensation or even feeling, in so far as it depends only on the bodily organs.
14 *Discours physique de la parole* (1666). Page references are to the second edition, 1677. There is an English translation, dated 1668. Rosenfield remarks that Cordemoy develops Descartes's argument involving lack of true speech among animals so fully that after him "the point was given very little attention, as if subsequent authors considered this the last word on the subject" (*From Beast Machine to Man Machine*, p. 40).
15 There is no problem, for Cordemoy (as for Descartes), in determining whether he himself possesses a soul, since it is evident to him, by introspection, "that certain thoughts always accompany in me most of the movements of my organs" (p. 3).
16 La Mettrie, *L'homme machine* (1747). A critical edition with notes and background material is *La Mettrie's* L'homme machine: *A Study in the Origins of an Idea*, ed. A. Vartanian (Princeton: Princeton University Press, 1960). [The translations given here are from La Mettrie 1996, but reference is also given to the translation in *Man A Machine* (La Salle, Ill.: Open Court, 1953) (abbreviated *MaM*), which contains the French text.]
17 Père G. H. Bougeant, *Amusement philosophique sur le langage des bestes* (1739).
18 This is not to deny that the method of explanation suggested by La Mettrie may be in principle correct. What concerns me here is not the adequacy of the proposed explanations of Descartes and others, but the observations on human language that elicited these attempts. [The prospect of being unable ever to scientifically explain the creative aspect of language use plays an important role in Chomsky's post 1966 discussions, where it illustrates general claims about the (biological) limitations of human intelligence. See the editor's introduction for discussion and references.]
19 G. Ryle, *The Concept of Mind* (London: Hutchinson, 1949). See J. Fodor, "Is Psychology Possible?" chap. I of *Psychological Explanation* (New York: Random House, 1968), for a critique of the views of Ryle and others regarding psychological explanation.
20 These are described in terms of "powers," "propensities," and "dispositions," which are characterized only through scattered examples. These constitute a new "myth" as mysterious and poorly understood as Descartes's "mental substance."
21 L. Bloomfield, *Language* (New York: Holt, 1933), p. 275. When a speaker produces speech forms that he has not heard, "we say that he utters them *on the analogy* of similar forms which he has heard." For Bloomfield, human language differs from animal communication systems in no fundamental way, but only by its "great differentiation." Otherwise, its function is similar. "Man utters many kinds of vocal noise and makes use of the variety: under certain types of stimuli he produces certain vocal sounds, and his fellows, hearing these same sounds, make the appropriate response" (p. 27). He holds that "language is a matter of training and habit" (p. 34) and that with careful statistical investigation "we should doubtless be able to foretell how many times any given utterance … would be spoken within a fixed number of days" (p. 37) (a conclusion that is certainly correct, since for almost all normal utterances the predicted number would be zero).
22 C. F. Hockett, *A Course in Modern Linguistics* (New York: Macmillan, 1958), §36, p. 50. He remarks that "it has been said that whenever a person speaks, he is either mimicking or analogizing," and he accepts this view, stating that "when we hear a

fairly long and involved utterance which is evidently not a direct quotation, we can be reasonably certain that analogy is at work" (p. 425). Among modern linguists, Hockett is unusual in that he has at least noticed that a problem exists. In discussing innovation, Hockett seems to imply that novel expressions can be understood only through reference to context (p. 303). In fact, failure to consider the linguistic mechanisms that determine the meaning of the ordinary, generally quite novel sentences of everyday life is typical of modern linguistics.

23 Modern discussions of the difference between human language and animal commu nication systems occasionally recapture some of the Cartesian insights. See, for example, L. Carmichael, "The Early Growth of Language Capacity in the Individual," in *New Directions in the Study of Language*, ed. E. H. Lenneberg.

24 J. G. Herder, *Abhandlung über den Ursprung der Sprache* (1772). This is now available in part, in *Herder's Sprachphilosophie*, ed. E. Heintel (Hamburg: Felix Meiner Verlag, 1960), pp. 1 87. Page references are to this volume. [Translations from this work are by Susan Judith Hoffmann; references remain as they were in the original edition. There is a modern translation of the work in Herder 1966.]

25 This is true as well of the development of language in the individual. Study of the "origin of language" is essentially a study of the "essence of language," in this period, and the growth of language in the individual and its growth in the nation are often taken to be parallel in their general characteristics. Cf. A. W. Schlegel, *Die Kunstlehre* (1801) (Stuttgart: W. Kohlhammer Verlag, 1963), p. 234: in the discovery of language by children, "that which takes place in the invention of language by the human race in general finds itself ever repeated, albeit in fainter traces"; in general, "in the acquisition of language, we find the same ability at work, which is present in the invention of language, in a higher degree" (p. 235). Under the influence of Humboldt, H. Steinthal goes even further and states, "There is no distinction between the primordial creation of language and its daily re creation" (*Grammatik, Logik und Psychologie*. [Berlin, 1855], p. 232).

26 *Discourse on the Method*, CSM I, 140.

27 Descartes does not restrict language to purely intellectual function in a narrow sense. See, for example, *Principles of Philosophy*, pt. IV, art. 197 (CSM I, 284):

> For we see that spoken or written words excite all sorts of thoughts and emotions in our minds. With the same paper, pen and ink, if the tip of the pen is pushed across the paper in a certain way it will form letters which excite in the mind of the reader thoughts of battles, storms and violence, and emotions of indignation and sorrow; but if the movements of the pen are just slightly different they will produce quite different thoughts of tranquillity, peace and pleasure, and quite opposite emotions of love and joy.

28 *Treatise the Third: Concerning Happiness, a Dialogue* (1741). In Harris's *Works*, ed. the Earl of Malmesbury (London: F. Wingrove, 1801), vol. I, p. 94.

29 In this discussion, Harris appears to be making the gratuitous assumption, typical of the modern variants of this doctrine, that, since man is capable of "infinite direc tions," he is therefore completely plastic; that is, the assumption that innate factors govern his intellectual development only marginally, if at all. Obviously this further assumption has no connection to the observation regarding freedom from the control of instinct and drives and regarding the infinite range of potential skill and know ledge. With this independent assumption, Harris is, of course, very much outside of the framework of Cartesian thought.

Elsewhere, Harris expresses himself in a manner which is susceptible to a rather different interpretation. In discussing the interplay between creative genius and rule (*Philological Inquiries* (1780) in *Works*, vol. II), he rejects the view "that *Geniuses*, tho' *prior to Systems*, were *prior also to Rules* [e.g., the unities of time and place, in the theory of drama], because *RULES* from the beginning *existed in their own Minds*, and were a part of that *immutable Truth*, which is eternal and everywhere" (p. 409). Genius and rules are "so *reciprocally* connected, that 'tis *GENIUS* which discovers *Rules* [these being implicit in the mind]; and then *RULES*, which govern *Genius*."

30 One would not refer to an act as "creative" simply on the basis of its novelty and independence of identifiable drives or stimuli. Hence the term "creative aspect of language use" is not entirely appropriate, without qualification, as a designation for the property of ordinary language that concerned Descartes and Cordemoy.

It is interesting, in this connection, to note that Galileo described the discovery of a means to communicate one's "most secret thoughts to any other person … with no greater difficulty than the various collocations of twenty four little characters upon a paper" as the greatest of all human inventions, comparable with the creations of a Michelangelo, a Raphael, or a Titian (*Dialogue on the Great World Systems* (1630) (Chicago: University of Chicago Press, 1953), pp. 116 117). I am indebted for this reference to E. H. Gombrich.

Compare the reference in the *Grammaire générale et raisonnée* to "this marvelous invention of composing from 25 or 30 sounds an infinite variety of words, which although not having any resemblance in themselves to that which passes through our minds, nevertheless do not fail to reveal all of the secrets of the mind, and to make intelligible to others who cannot penetrate into the mind all that we conceive and all of the diverse movements of our souls." (p. 27; PRG, 65 66). [Translations of passages in the Port Royal *Grammaire* here, and subsequently, are from Arnauld and Lancelot 1975 (abbreviated PRG).]

31 Cf. note 25. References are to pp. 233 234 of the edition cited there, which is vol. II of a collection of *Kritische Schriften und Briefe*. [Translations of Chomsky's quotations from the works of A. W. Schlegel, and of one quotation from the work of F. Schlegel, are by Susan Judith Hoffmann; references remain as they were in the original edition.]

32 *Briefe über Poesie, Silbenmass und Sprache* (1795). In *Sprache und Poetik*, vol. I of *Kritische Schriften und Briefe* (Stuttgart: W. Kohlhammer Verlag, 1962), p. 152.

33 "… the natural media of art are ways [*Handlungen*] for human beings to outwardly manifest what is inward." (*Die Kunstlehre*, p. 230 the only such means are "words, sounds, gestures"); therefore it is natural for Schlegel to conclude that language itself is a primordial art form and that it is, further, "from its inception onward the primordial substance of poetry" (p. 232).

34 For Schlegel (*Die Kunstlehre*, p. 225), "'Art' is 'a boundless thought'"; "its purpose, that is, the direction of its striving can surely be indicated in general terms, but what it can and ought to achieve over the course of time no concept of the understanding can grasp because it is infinite." The passage that is paraphrased in the text then continues as follows:

> In poetry the expressive potentiality that is found in the arts is found to an even higher degree since other arts do after all have in light of their restricted media or means of representation [*Darstellung*] a determinate sphere of activity that could allow itself to be circumscribed to some

degree. The medium of poetry is precisely the medium through which the human spirit awakens to itself at all, and through which it fastens on to its presentations [*Vorstellungen*] in arbitrary associations and expressions that is, language. Poetry is therefore not even bound to objects, it rather makes its own object for itself; it is the most comprehensive of all the arts and is, as it were, the omnipresent universal spirit in them. That which, in the representations of the remaining arts raises us up out of everyday reality into a world of fantasy, is called their poetical element. Poetry therefore designates in this general sense artistic invention, the wondrous act whereby it enriches nature; as its name asserts, it is a true creation and bringing forth. Every outward material representation is preceded by an idea in the mind of the artist in which language always comes into play as the mediator of awareness; consequently one can say that they always emerge from the womb of poetry. Language is not a product of nature, rather it is an imprint [*Abdruck*] of the human mind which exhibits the emergence and connections of its presentations as well as the operating mechanism [of the human mind]. Thus in poetry what has already taken shape is given shape again, and its plasticity is just as limitless as spirit's ability to turn back on itself in reflections of ever-increasing potentialities.

35 For further discussion of the character, sources, and general development of romantic aesthetic theory, see M. H. Abrams, *The Mirror and the Lamp* (Oxford: Oxford University Press, 1953). There is some discussion of the philosophy of language of romanticism in the first volume of E. Cassirer, *Philosophie der symbolischen Formen* (1923), trans. *The Philosophy of Symbolic Forms* (New Haven: Yale University Press, 1953). See also E. Fiesel, *Die Sprachphilosophie der deutschen Romantik* (Tübingen: J. C. B. Mohr, 1927).

36 In particular, in his *Über die Verschiedenheit des Menschlichen Sprachbaues*, pub lished posthumously in 1836. A facsimile edition appeared in 1960 (F. Bonn: Dümmlers Verlag). Page references here are to this edition. Parts are translated into English in M. Cowan, *Humanist without Portfolio* (Detroit: Wayne State University Press, 1963). A full translation and commentary are in preparation by J. Viertel. Backgrounds of Humboldt's linguistic theories are discussed in R. L. Brown, "Some Sources and Aspects of Wilhelm von Humboldt's Conception of Linguistic Relativity," unpublished University of Illinois doctoral dissertation (1964). [Most of the translations in this edition are by Susan Judith Hoffmann, but some are P. L. Heath's translations in Humboldt 1999.]

Bloomfield refers to Humboldt's treatise as "the first great book on general linguistics" (*Language*, p. 18). Considered against the background that we are surveying here, it seems to mark the terminal point of the development of Cartesian linguistics rather than the beginning of a new era of linguistic thought. See Chomsky, *Current Issues in Linguistic Theory*, for some discussion of Humboldtian general linguistics, its relation to the work of the following century, and its reemergence in contemporary studies of language and cognition.

37 The German translations are Humboldt's. These concepts of Humboldt's do not seem to me to be entirely clear, and I will focus attention here on one aspect of them. That a single consistent interpretation of these notions is clearly determined by the text is not obvious. Despite this qualification, it seems safe to conclude that what will be outlined here is at least one of the central strands in Humboldt's thought. I am indebted to J. Viertel for many observations and suggestions regarding the interpretation of the text.

38 For Humboldt, to speak of a word in a language as "articulated" is to refer it to the system of underlying elements from which it is constructed, elements that could be used to form infinitely many other words according to definite intuitions and rules. It

is in this sense that a word is an "articulated object," grasped, in perception, by the exercise of the "human power of speech" rather than by some process analogous simply to "animal sensory capacity." See p. 71:

> But now what *articulation* adds to the mere evocation of its meaning [*Bedeutung*]… [i.e., of the meaning of a perceived word] … is that it presents the word directly through its form as a part of an unbounded whole, a language. For even in single words, it is by means of this that we are given the possibility of constructing, from the elements of the language, a truly indefinite number of other words according to specific intuitions and rules, and thereby to establish among all words an affinity corresponding to the affinity of concepts. (Humboldt 1999: 57 58 (with modifications))

He then clarifies his meaning further, pointing out that it is only the generative processes that are grasped by the mind, and that language cannot be regarded

> as a material that sits there, surveyable in its totality, or communicable little by little, but must be seen as something that eternally produces itself, where the laws of production are determined, but the scope and even to some extent the nature of the product remain totally unspecified. (Humboldt 1999: 58)

Compare A. W. Schlegel's definition of "articulation" (*Kunstlehre*, p. 239):

> The articulation (the articulated moments of discourse, as it were) consists in arbitrary deliberate movements of the organ and therefore corresponds to similar spiritual activities.

He points out that articulated language is different in kind from animal cries or expres sions of emotion that it cannot be approached by a series of "crude imitations" but requires a new principle.

See also note 30.

39 See pp. 58 59: "The constant and uniform element in this mental labor of elevating articulated sound to an expression of thought, when viewed in its fullest possible comprehension and systematically presented constitutes the *form* of language" (Humboldt 1999: 50). It seems to me that Humboldt's "form of language" is essentially what would in current terminology be called "the generative grammar" of a language, in the broadest sense in which this term has been used. See note 2 and p. 83 below.

40 For example, the lingua franca of the Mediterranean coast; or, we may add, animal communication systems or "language games" of the sort referred to by Bougeant, Bloomfield, Wittgenstein, and many others and proposed by them as typical and paradigmatic as the "primitive forms" of language.

41 In identifying a particular state of a language as an object of description with "psychological reality," we depart from Humboldt, who is extremely unclear about the relation of synchronic to diachronic description.

42 In his *Hermes*, Harris perhaps comes closest to the Humboldtian conception of "form" in a citation from Ammonius, which relates motion to dance, timber to a door, and "the power of producing a vocal sound" (as the material basis for speech) to "that of explaining ourselves by Nouns, or Verbs" (as its form, which derives from man's unique soul as the material basis derives from nature). Cf. Harris, *Works*, vol. I, p. 393, footnote.

Elsewhere, in another connection, Harris discusses a conception of "form" that is much richer, however. In his *Philosophical Arrangements* (1775; *Works*, vol. II) he develops the notion of "form" as "animating principle": "the animating form of a natural body is neither its organization, nor its figure, nor any other of these inferior

forms, which make up the system of its visible qualities; but 'tis the power, which, not being that organization, nor that figure, nor those qualities, is yet able to produce, to preserve, and to employ them" (p. 59).

43 *Lectures on Dramatic Art and Literature* (1808), translated by John Black, p. 340 of the second edition, (London: George Bell and Sons, 1892).

44 "Lectures and Notes of 1818," in T. Ashe (ed.), *Lectures and Notes on Shakespeare and other English Poets* (London: George Bell and Sons, 1893), p. 229. Some of Coleridge's comments on the nature of mind foreshadow Humboldt's observations on language in their emphasis on the diversity of creative potential within the bounds of finite rules. In the same lecture he denies that genius must be opposed to rule (again paraphrasing Schlegel cf. also note 29) and argues that "no work of true genius dares want its appropriate [organic] form." "As it must not, so genius cannot be lawless: for it is even this that constitutes its genius the power of acting creatively under laws of its own origination."

Elsewhere, he states that "the mind does not resemble an Aeolian harp, nor even a barrel organ turned by a stream of water, conceive as many tunes mechanized in it as you like, but rather as far as objects are concerned a violin or other instrument of few strings yet vast compass, played on by a musician of Genius" (quoted by R. Wellek, *Kant in England* (Princeton: Princeton University Press, 1931), p. 82). For much additional relevant material, see Abrams, *The Mirror and the Lamp*.

45 It should be noted that this topic does not seem to have been raised in any explicit way in the Schlegel Humboldt correspondence. See A. Leitzmann (ed.), *Briefwechsel zwischen W. von Humboldt und. W. Schlegel* (1908). This correspondence contains much discussion of "organic" and "mechanical" form but in a different connection, namely, with reference to the relation between inflection and agglutination as linguistic processes, a topic that is also developed at length in Humboldt's *Über die Verschiedenheit des menschlichen Sprachbaues*.

The question of how the form of language arises from and determines individual "creative" acts is a not uncommon one during this period. Cf., for example, Coleridge: "What a magnificent History of acts of individual minds, sanctioned by the collective Mind of the Country a Language is … a chaos grinding itself into compatibility." Quoted in A. D. Snyder, *Coleridge on Logic and Learning* (New Haven: Yale University Press, 1929), p. 138.

46 The significance and origins of this notion are described in R. Berthelot, *Science et philosophie chez Goethe* (Paris: F. Alcan, 1932), and R. Magnus, *Goethe als Naturforscher* (Leipzig: Barth, 1906), trans. H. Norden, *Goethe as a Scientist* (New York, 1949). As is well known, the concept of organic form develops in biology, as well as in philosophy and criticism, during the period that we are now reviewing. Compare, for example, Schlegel's notion of organic form with Blumenbach's concept of "Bildungstrieb" in biology, namely, the concept of a living, generative, formative principle internal to an organism that determines its onto genesis and leads it from germ to adult (cf. Berthelot, p. 42; he states that this influenced Kant's similar formulations in the *Critique of Judgment*). Berthelot characterizes Schelling's Naturphilosophie as conceiving of nature "as a dynamic qualitative transformation producing new forms irreducible to previous ones, by the action of a spontaneous, internal, primitively unconscious activity" (p. 40). Many other references might be given to illustrate the parallel and interplay. These matters

are discussed in various places, e.g., A. O. Lovejoy, *The Great Chain of Being* (New York: Harper & Row, 1936) and Abrams, *The Mirror and the Lamp*. For further background and many references, see E. Mendelsohn, "The Biological Sciences in the Nineteenth Century: Some Problems and Sources," *History of Science* 3 (1964), pp. 39 59.

47 Quoted in Magnus, *Goethe als Naturforscher*, p. 59. In *The Great Chain of Being* Lovejoy traces the idea of a logical "Urbild" to J. B. Robinet's *De la Nature* (1761 1768). He quotes Robinet (p. 279) as defining the notion "prototype" as "an intellectual principle that changes only in so far as it realizes itself in matter"; this notion Robinet then elaborated with respect to all animate and even inanimate nature.

48 The title of Humboldt's major work should not lead one to assume that he would be sympathetic to the view that each language is a unique historical product that may, in principle, have any imaginable structure. This view, in one form or another, has been expressed by many post Humboldtian linguists. To mention just the temporal extremes, it can be illustrated by W. D. Whitney's critique of Humboldtian linguistics ("Steinthal and the Psychological Theory of Language," *North American Review*, 1872; reprinted in *Oriental and Linguistic Studies* (New York: Scribner, Armstrong, 1874)). in which he concludes that "the infinite diversity of human speech ought alone to be a sufficient bar to the assertion that an understanding of the powers of the soul involves the explanation of speech" (*Oriental and Linguistic Studies*, p. 360) and that language is strictly a "historical product," nothing other than "the sum of words and phrases by which any man expresses his thought" (p. 372); or M. Joos's summary of what he calls the "Boasian" tradition of American linguistics as adopting the view "that languages could differ from each other without limit and in unpredict able ways" (M. Joos (ed.), *Readings in Linguistics* (Washington: American Council of Learned Societies, 1957), p. 96). Humboldt, in contrast, repeatedly expresses his opinion that, in their general structural features, languages are cast to the same mold. It seems to me that he is consistent in adopting the position that he expresses clearly in a letter to A. W. Schlegel (1822, cf. Leitzmann, *Briefwechsel zwischen W von Humboldt und A. W. Schlegel*, p. 54): "That all languages, in terms of grammar, look quite similar to each other is indisputable, if one investigates their inner workings profoundly, rather than superficially." Furthermore, this is clearly the only view compatible with his Platonistic theory of language acquisition (cf. pp. 101 102 below).

See Chomsky, *Current Issues in Linguistic Theory*, for some further discussion of the historical importance of Whitney's influential but (in my opinion) utterly wrong headed and superficial critique.

49 As emphasized by H. Steinthal in his *Gedächtnissrede auf Humboldt an seinem hundertjahrigen Geburtstage* (Berlin, 1867).

50 R. Rocker, *Nationalism and Culture*, trans. R. E. Chase (London: Freedom Press 1937). This judgment is based largely on Humboldt's early essay *Ideen zu einem Versuch die Grenzen der Wirksamkeit des Staats zu bestimmen* (1792). Parts of this are translated in Cowan, *Humanist without Portfolio*, pp. 37 64.

51 The political meaning of a "natural rights" doctrine such as Humboldt's depends very much on the exact way in which it is phrased and the social context in which it appears, and an evaluation of these questions, in the present case, raises many problems. The terms in which Humboldt frames this doctrine suggest a comparison with Marx's *Economic and Philosophic Manuscripts* (1844; trans. T. B. Bottomore,

in *Marx's Concept of Man*, ed. E. Fromm (New York: Ungar, 1961), with their description of the "alienation of labor when work is *external* to the worker, … not part of his nature … [so that] …he does not fulfill himself in his work but denies himself … [and is] … physically exhausted and mentally debased" (p. 98) and their definition of the "species character" of human beings as "free, conscious activity" and "productive life" (p. 101), of which man is deprived by the alienated labor that "casts some of the workers back into a barbarous kind of work and turns others into machines" (p. 97), as well as with Marx's well known reference to a higher form of society in which "labor has become not only a means of life, but also the highest want in life" (*Critique of the Gotha Program*, 1875).

Humboldt's remarks might be compared with Rousseau's critique of modern social institutions in the *Discourse on the Origins and Foundations of Inequality among Men* (1755; translated in *The First and Second Discourses*, ed. R. D. Masters (New York: St. Martin's, 1964). Rousseau's goal is "to set forth the origin and progress of inequality, the establishment and abuse of political societies, insofar as these things can be deduced from the nature of man by the light of reason alone, and independently of the sacred dogmas which give to sovereign authority the sanction of divine right" (p. 180). Along strictly Cartesian lines, he characterizes an animal as "only an ingenious machine to which nature has given senses in order to revitalize itself and guarantee itself, to a certain point, from all that tends to destroy or upset it." "Every animal has ideas, since it has senses; it even combines its ideas up to a certain point, and in this regard man differs from a beast only in degree" (cf. note 13). What distinguishes man from beast in an absolute way is that man is a "free agent" and has "the consciousness of this freedom" (a further specific differ ence, perhaps reducible to man's freedom, is his "faculty of self perfection," as an individual and a species). Although much in man's nature can be attributed to properties of "the human machine," still man's behavior is uniquely beyond the bounds of physical explanation. "For physics explains in some way the mechanism of the senses and the formation of ideas; but in the power of willing, or rather of choosing, and in the sentiment of this power are found only spiritual acts about which the laws of mechanics explain nothing" (pp. 113f.).

From this essentially Cartesian picture of human nature, Rousseau develops his theory and evaluation of modern society. Since freedom is "the most noble of man's faculties," one is "degrading one's nature, putting oneself on the level of beasts enslaved by instinct" by renouncing freedom and subjecting oneself to the dictates of a "ferocious or insane master" (p. 167). The national state, modern social organization, and conventional law all originate in a kind of conspiracy by the rich and powerful to preserve and institutionalize power and property, a conspiracy that "gave new fetters to the weak and new forces to the rich, destroyed natural freedom for all time, established forever the law of property and inequality, changed a clever usurpation into an irrevocable right, and for the profit of a few ambitious men henceforth subjected the whole human race to work, servitude, and misery." Finally, with the establishment of the national state, "the most decent men learned to consider it one of their duties to murder their fellow men; at length men were seen to massacre each other by the thousands without knowing why" (pp. 160 161). In so far as society institutionalizes property rights, magistracy, and arbitrary power, it violates natural law (pp. 168ff.). It is contrary to natural right and against the law of

nature that "a handful of men be glutted with superfluities while the starving multitude lacks necessities" (p. 181) or that "each man finds his profit in the misfortune of others" (p. 194); "and the jurists, who have gravely pronounced that the child of a slave would be born a slave, have decided in other terms that a man would not be born a man" (p. 168). Man has become mere "sociable man," living "outside of himself" and "only in the opinion of others," from whose judg ment alone "he draws the sentiment of his existence" (p. 179). He can regain true humanity only by abolishing the status of rich and poor, powerful and weak, master and slave by "new revolutions" that will "dissolve the government altogether or bring it closer to its legitimate institution" (p. 172); "the uprising that ends by strangling or dethroning a sultan is as lawful an act as those by which he disposed, the day before, of the lives and goods of his subjects" (p. 177). [Chomsky expands upon his discussion of Rousseau and Humboldt in "Language and Freedom" (originally published in 1970; an accessible reprint is found in Chomsky 1987).]

52 N. S. Troubetzkoy, "La phonologie actuelle," *Psychologie de langage* (Paris, 1933), p. 245.

53 This notion seems to have developed in connection with the controversy over use of the vernacular to replace Latin. Cf. F. Brunot, *Histoire de la langue française* (Paris: Librairie Armand Colin, 1924), vol. IV, pp. 1104f., and G. Sahlin, *César Chesneau du Marsais et son rôle dans l'évolution de la Grammaire générale* (Paris: Presses Universitaires, 1928), pp. 88 89, for some early references, including one to a 1669 source that goes so far in defense of the naturalness of French as to claim that "the Romans think in French before speaking in Latin." Diderot is so convinced of the "naturalness" of French that he regards it as more suitable for science than for literature, the other European languages, "unnatural" in their word order, being more suited for literary expression (*Lettre sur les sourds et muets*, 1751). Englishmen tended to have a different view of the matter. Bentham, for example, held that "of all known languages, English is … that in which, in the highest degree, taken in the aggregate, the most important of the properties desirable in every language are to be found" (*Works*, ed. J. Bowring (New York: Russell and Russell, 1962), vol. VIII, p. 342). Huarte, writing in the late sixteenth century, took for granted "the Analogy and Correspondence between the Latin Tongue, and the Rational Soul": *"Latin* words, and the manner of speaking this Tongue, are so Rational, and so agreeably strike the Ear, that the Rational Soul meeting with the Temperament necessary to invent a very eloquent Language, immediately stumbles on the Latin" (*Examen de Ingenios*, op. cit., p. 122).

From the seventeenth century, there was much discussion of the possibility of inventing a "philosophical language" that would reflect "la vraie philosophie" and the principles of thought better than any actual human language. An interest in this problem is apparently at the roots of Leibniz's interest in comparative grammar, which might reveal the "excellencies of language." For discussion of these develop ments, see Couturat and Leau, *Histoire de la langue universelle* (Paris, 1903); Margaret M. C. Mclntosh, "The Phonetic and Linguistic Theory of the Royal Society School, from Wallis to Cooper," unpublished B.Litt. thesis, Oxford University (1956); Cassirer, *The Philosophy of Symbolic Forms*.

54 B. Lamy, *De L'art de parler* (1676). There are, however, stylistic reasons that may lead one to invert the "ordre naturel" in many languages; not, however, in French,

which does not, he maintains, make use of such "figures de Grammaire," since "it relishes cleanliness and simplicity; that is why it expresses things as much as it can in the simplest and most natural order" (p. 23). Cf. also pp. 26 27.

55 J. Wilkins, *An Essay towards a Real Character and a Philosophical Language* (1668).

56 The assumption of a "natural order," however, has the advantage that it does not fly in the face of the facts quite so obviously as the belief that language can be described in terms of "habits" or "dispositions to respond" or that the syntactic structure of a language is some sort of list of patterns. It is, therefore, not excluded that the notion of "natural order" can be clarified and developed as a hypothesis of some significance regarding language structure.

57 Leibniz, *Nouveaux essais sur l'entendment humain*, book III, chap. VII; trans. *New Essays Concerning Human Understanding*, ed. A. G. Langley (La Salle: Open Court, 1949). He goes on to maintain that "an exact analysis of the signification of words would show us better than anything else the workings of the understanding" (p. 368 of the 1949 edition). For further discussion of Leibniz's concern with language, see H. Aarslef, "Leibniz on Locke on Language," *American Philosophical Quarterly* 1 (1964), pp. 1 24.

58 F. Schlegel, *Geschichte der alten und neuen Literatur* (1812); cited by Fiesel, *Die Sprachphilosophie der deutschen Romantik*, p. 8. See also A. W. Schlegel, "De l'étymologieen général," in *Oeuvres écrites en français*, ed. E. Böcking (Leipzig, 1846), p. 133: "It was often said that grammar is logic at work; but there is more: it constitutes a profound analysis, a subtle metaphysics of thought."

59 Occasionally, from quite unexpected sources. For example, Proudhon's scholarship application to the Besancon Academy, in 1837, announced his intention of developing a general grammar in which he hoped to "search for the psychology of new regions, the philosophy of new paths; study the nature and mechanism of the human mind with respect to the most striking and recognizable of its faculties, speech; determine, on the basis of the origin and working of language, the source and organization of human beliefs; apply, in one word, grammar to metaphysics and ethic, and achieve a thought over which profound geniuses fret. …" (*Correspondance de P. J. Proudhon*, ed. J. A. Langlois (Paris: Librairie Internationale, 1875), vol. I, p. 31).

Cf. also J. S. Mill: "Grammar …is the beginning of the analysis of the thinking process. The principles and rules of grammar are the means by which the forms of language are made to correspond with the universal forms of thought. The distinctions between the various parts of speech, between the cases of nouns, the moods and tenses of verbs, the functions of particles, are distinctions in thought, not merely in words… The structure of every sentence is a lesson in logic" (Rectorial Address at St. Andrews, 1867, cited with characteristic modern disapproval by Jespersen, *The Philosophy of Grammar* (London: Allen and Unwin, 1924), p. 47).

Another and rather different development of the view that language (in its deeper structure) mirrors thought can be found in the work of Frege, Russell, and the early Wittgenstein. This is well known, and I will not discuss it further here. [For a discussion of some aspects of Chomsky s view of Frege, see the second chapter of Chomsky 1996.]

60 N. Beauzée, *Grammaire générale, ou exposition raisonnée des éléments nécessaires du langage* (1767). Page references here and below are to the revised and corrected edition of 1819.

61 This of course leaves quite open the question of how creative thought is possible, and the discussion of this matter was no more satisfactory than any account that can be given today that is, it is left as a complete mystery. Cordemoy, for example, attributes "new thoughts that come to us, without being able to find their cause in ourselves, or to attribute them to others" to "inspiration," that is, to communication from disembodied spirits (op. cit., pp. 185 186). Many others of the period would agree that, in some way or other, "man possesses some analogy to the Divine attributes in his intellectual faculties" (Herbert of Cherbury, *De Veritate* (1624), p. 167; page references here and below are to the translation by M. H. Carré, University of Bristol Studies No. 6 (1937)). This invocation of the supernatural should be considered against the background of the revived neo Platonism, with its interpretation of human creativity as an analogue of divine "emanation," in aesthetic theory from the sixteenth century through romanticism. For discussion, see Lovejoy, *The Great Chain of Being*, and Abrams, *The Mirror and the Lamp*, and further references given there. [It is apparent from the examples that Chomsky is speaking here of causes or sources of creative thought. Later work (e.g., Chomsky 1972) seems to allow that one could give an account of how creative thought is *possible*: one could speak to the nature of the mind that would allow it. See the editor's introduction and also McGilvray 2005.]

62 Recall that for La Mettrie the soul is not a separate substance; rather, "since all the soul's faculties depend so much on the specific organization of the brain and of the whole body, that they are clearly nothing but that very organization itself: the machine is perfectly explained!… Thus the soul is merely a vain term of which we have no idea and which a good mind should use only to refer to that part of us which thinks" (p. 26; *MaM*, p. 128). He admits forthrightly, regarding the "imaginative faculty" of the brain, that we know "as little about its nature as we do about its method of working" and that its products are "the wonderful and incomprehensible result of the organisation of the brain" (p. 15; *MaM*, p. 107). Later writers are much less diffident and describe the brain as secreting thought much as the liver secretes bile (Cabanis), and so on.

63 The Cartesians characteristically assumed that mental processes are common to all normal humans and that languages may therefore differ in the manner of expression but not in the thoughts expressed. Cordemoy, for example, in discussing language learning (*Discours*, pp. 40ff.; cf. p. 101 below), describes the acquisition of a second language as merely a matter of assigning new linguistic expressions to the ideas that are already associated with expressions of the first language. It follows, then, that there should be no fundamental difficulty in translating from one language to another. This claim, of course, would be vigorously denied by the romantics, who think of language not just as a "mirror of the mind" but as a constitutive element in mental processes and as a reflection of cultural individuality (cf. Herder: "The best account of the history and the diverse characteristics of human understanding and sentiment would thus be a philosophical comparison of languages, for the understanding and character of a people are in every case stamped in their language." *Ideen zur Philosophie der Geschichte der Menschheit*, 1784 1785, in Heintel, op. cit., p. 176).

64 We return to some of its concrete proposals directly.

65 Page references are to *Works*, vol. I (cf. note 28).

66 It follows, then, that the interrogative and indicative (in which the response is made) are closely related. "So near indeed is this Affinity, that in these two Modes alone the Verb retains the same Form, nor are they otherwise distinguished, than either by the Addition or Absence of some small particle, or by some minute change in the collocation of the words, or sometimes only by a change in the Tone, or Accent" (p. 299). More precisely, in the case of a "simple interrogative" (i.e., a simple yes or no question), the response is (except for possible ellipsis) made in almost the same words as the interrogative; "indefinite interrogatives," however, "may be answered by infinite affirmatives, and infinite negatives. For instance *Whose are these Verses?* We may answer affirmatively *They are* Virgil's, *They are* Horace's, *They are* Ovid's, etc. or negatively *They are not* Virgil's, *They are not* Horaces, *They are not* Ovid's, and so one, either way, to infinity" (p. 300, footnote).

67 Apart from its Cartesian origins, the Port Royal theory of language, with its dis tinction between deep and surface structure, can be traced to scholastic and renais sance grammar; in particular, to the theory of ellipsis and "ideal types" that reached its fullest development in Sanctius's *Minerva* (1587). For some discussion, see Sahlin, op. cit., chap. I and pp. 89f. [As noted earlier, quotations from the Port Royal *Grammar* Lancelot and Arnauld's *Grammaire générale et raisonnée* use the translation in Arnauld and Lancelot 1975 (which is occasionally modified). Page references are given to both the first French edition (1660) and to Arnauld and Lancelot 1975 (abbreviated PRG).]

68 This transformation is not mentioned, but it is implicit in the examples that are given.

69 Arnauld, *La logique, ou l'art de penser* (1662). Translated by J. Dickoff and P. James as *The Art of Thinking: Port Royal Logic* (Indianapolis: Bobbs Merrill, 1964). Page references are to this translation. [Also translated by J. V. Buroker in Arnauld and Nicole 1996 (abbreviated PRL), to which page references are also given.] For some recent discussion of the linguistic significance of this work, see H. E. Brekle, "Semiotik und linguistische Semantik in Port Royal," *Indogermanische Forschungen* 69 (1964), pp. 103 121.

70 The notion "idea" in Cartesian thought is crucial but difficult. Several terms are used (e.g., "idea," "notion") apparently without a systematic distinction in sense, and the concept itself is not clearly characterized. In the *Meditations*, III, Descartes relates the term "idea" to "image," stating that "some of my thoughts are as it were the images of things, and it is only in these cases that the term 'idea' [Latin: *idea*] is strictly appropriate" (CSM II, 25; of course, these "images" may be derived by imagination or reflection, rather than received through sense). In his reply to Hobbes's *Objection* to this passage, Descartes clarifies his intentions (modifying his formulation in the process, so it appears) stating that "I am taking the word 'idea' to refer to whatever is immediately perceived by the mind. For example, when I want something, or am afraid of something, I simultaneously perceive that I want, or am afraid; and this is why I count volition and fear among my ideas" (CSM II, 127). The latter use of "idea" as, essentially, an object of thought, is the one that seems consistent with his general usage. For example, in the *Discourse on the Method* he speaks of "certain laws which God has so established in nature, and of which he has imprinted such notions in our minds" (CSM I, 131). Similarly, in the *Principles of Philosophy* (pt. I, art.13), no fundamental distinction is made between "the ideas of numbers and

shapes" and "such common notions as: *If you add equals to equals the results will be equal"* (CSM I, 197). The latter usage of the term "idea," as anything that can be "conceived" (not merely "imagined"), is the one carried over to the Port Royal *Logic*. In this sense, concepts of varied types, even propositions are ideas. This usage is widespread. Lamy (op. cit., p. 7), who makes no pretense to originality, describes ideas as "the objects of our perceptions" and asserts that "besides these ideas, which are excited by things that touch our body, we find others deep in our nature, which do not come into our mind through the senses for example, those which respresent primary truths like: You must return to someone what belongs to him; It is impossible for something to be and not to be at one and the same time, etc." In general, the discussion of simple and complex propositions throughout the Port Royal *Grammar* and *Logic* suggests this concept of "idea," since propositions are described as formed by combining ideas, and complex ideas are described as based on underlying constituent propositions. In this sense, "idea" is a theoretical term of the theory of mental processes; the comprehension (i.e., intension or meaning) of an idea is the fundamental notion in semantic interpretation, and in so far as the deep structure of language is regarded as a direct reflection of mental processes, it is the fundamental notion in the analysis of thought.

For further discussion see J. Veitch, *The Method, Meditations, and Selections from the Principles of Descartes* (Edinburgh: Blackwood and Sons, 1880), note II, pp. 276 285.

71 In the French original, the cited sentence is: "La doctrine qui met le souverain bien dans la volupté du corps, laquelle a été enseignée par Epicure, est indigne d'un Philosophe." The Dickoff James translation, which I have followed elsewhere, translates this as: "The doctrine which identifies the sovereign good with the sensual pleasure of the body and which was taught by Epicurus is unworthy of a philoso pher." But in this translation the explicative relative "which was taught by Epicurus" would naturally be taken as a determinative clause conjoined with the first determi native clause "which identifies…" in which case the point of the example is lost. [In Arnauld and Nicole 1996, the sentence is translated: "The doctrine that places the highest good in bodily pleasure, which was taught by Epicurus, is unworthy of a philosopher" (90).]

72 Notice, incidentally, that adjective noun constructions in the surface structure may derive by grammatical transformations of the type proposed in the Port Royal *Grammar* from either type of relative, as is evident from the examples given there and, more strikingly, in such ambiguous examples as Jespersen's "The industrious Japanese will conquer in the long run" (*Philosophy*, p. 112).

73 Notice that, in such cases, it is not true that each of the elementary abstract objects constituting the deep structure itself underlies a possible sentence; thus "je vous dis," for example, is not a sentence in itself. In current terminology, it is not the case that each item generated by the underlying base (phrase structure) rules underlies a possible kernel sentence. Similarly, in all work in transformational generative gram mar of the last ten years or more, it has been taken for granted that the phrase structure rules can introduce "dummy symbols" that receive a representation in terms of morpheme strings only as a result of application of embedding rules of one sort or another (as, for example, in verb complement constructions in English), and the elementary strings in which these dummy symbols appear will not underlie

kernel sentences. Various related ideas that have been explored during this period are summarized and discussed in Chomsky, *Aspects of the Theory of Syntax*, chap. III. [See also the bracketed discussion and references for note 80.]

74 A rather different analysis of these structures is presented by Beauzée, op. cit. He regards them as based on relative clauses with the antecedent transformationally deleted. Thus the sentences "L'état présent des Juifs prouve que notre religion est divine," "Ich glaube dass ich liebe," and "I think (that) I love," derive, respectively, from "L'état présent des Juifs prouve une vérité qui est, notre religion est divine," "Ich glaube ein Ding dass ist, ich liebe," and "I think a thing that is, I love" (p. 405).

75 For further discussion, see Chomsky, *Aspects of the Theory of Syntax*. It is worth mentioning that the theory of transformational generative grammar has in many respects moved toward a point of view like that implicit in the Port Royal theory, as new evidence and insights have accumulated during the few years in which it has, once again, become an object of fairly intensive investigation.

76 Some earlier notions are reviewed by Sahlin, *César Chesneau*, pp. 97f. The idea that a sentence can be regarded simply as a sequence of words or word categories, with no further structure, is frequently expressed (whether or not it is actually believed) by many later writers.

77 Notice that this is referred to as the principal, not the unique role of verbs. They are also used "to indicate other movements of our minds, as in to desire, to ask, to command, etc." (p. 90). These matters are taken up again in chap. XV, where the grammatical means by which these mental states and processes are realized in various languages are briefly discussed. See p. 79 above.

78 The *Grammar* goes on to observe that it would be a mistake to assume, with certain earlier grammarians, that verbs necessarily express actions or passions or something that is taking place, and it offers as counterexamples such verbs as "existit," "quiescit," "friget," "alget," "tepet," "calet," "albet," "viret," "claret" (p. 94).

79 As noted earlier (p. 117): "it is often necessary to transform such a sentence from the active to the passive voice in order to put the argument into its most natural form and to express explicitly that which is to be proved."

80 It is hardly just to attribute this insight to twentieth century British philosophy, as its "central and fundamental discovery" (cf. Flew, *Introduction to Logic and Language*, First series (Oxford: Blackwell, 1952), p. 7; or Wittgenstein, *Tractatus Logico Philosophicus* (1922), 4.0031, where it is attributed to Russell). Nor is the observation that "grammatical resemblances and dissimilarities may be logically misleading" (Flew, p. 8) quite as novel an insight as Flew suggests. See, for example, p. 91 below.

The general assumption of Cartesian linguistics is that the surface organization of a sentence may not give a true and full representation of the grammatical relations that play a role in determining its semantic content, and, as we have noted, a theory of grammar is sketched in which actual sentences are derived from underlying "deep structures" in which these relations are grammatically represented. The extent to which "logical form" is actually represented by the syntactically defined deep structures, in the technical modern sense or the related sense suggested in Cartesian linguistics, is a further and in many respects open question. See J. Katz, *The Philosophy of Language* (New York: Harper & Row, 1966), for discussion.

[Chomsky entertained the view that 'semantic intepretation' takes place at deep structure in his 1965 *Aspects*. He was to abandon this idea soon after in favor of

increasingly refined versions of a view he had adopted earlier in his *Logical Structure of Linguistic Theory* (published as Chomsky 1975b) and in *Syntactic Structures*, that semantic interpretation takes place at an 'output' level of a derivation, where "con ceptual intentional" systems use the product of a derivation as a "tool" (*Syntactic Structures*) for whatever operations they perform. By the 1970s, that output level of a derivation came to be called "LF" (for "logical form") or, later in the 1990s, SEM (for "semantic interface"). Deep structure but not as the 'place' where semantic interpretation takes place remained until the early 1990s as the place where basic "thematic assignments" are made, but it was abandoned as the "minimalist program" developed and more and more of what used to be thought of as irreducible linguistic structure came to be seen as 'epiphenomena' of primitive operations. Quite recently (2001), even LF is abandoned as a 'level' of a derivation, and SEM comes to indicate simply an "interface" with other mental/internal systems. For relevant but quite often technical reading, see *Syntactic Structures* and Chomsky 1975b, 1965,1975a and b, 1980,1986,1992,1995b, 2000, 2001, 2005, 2007.

It is quite likely that Chomsky's reading of the Cartesian linguists in the late 1950s and early 1960s influenced his decision to endorse provisionally and temporarily Katz and Postal's suggestion that semantic interpetation takes place at deep structure, rather than at some 'output' level. For some comment on the influence of this reading from Chomsky, see his *Current Issues in Linguistic Theory* and *Aspects of the Theory of Syntax*, especially the latter.]

81 Referred to, typically, as the "natural order." See pp. 75 76 above.

82 Many of Du Marsais's published and unpublished works on language are printed posthumously in *Logique et Principes de Grammaire* (1769). Page references here are to this volume. The correlation between freedom of word order and inflection is noted by many other writers, e.g., Adam Smith in his *Considerations concerning the First Formation of Languages*.

83 When Bloomfield (along with many others) criticizes premodern linguistics for obscuring the structural difference between languages "by forcing their descriptions into the scheme of Latin grammar" (*Language*, p. 8), he is presumably referring to such claims as this, which he regards as having been disproven. If so, then it must be observed that his book contains no evidence to support either the conclusion that philosophical grammar was wedded to a Latin model, or the conclusion that its actual hypothesis concerning the uniformity of underlying grammatical relations has been brought into question by modern work.

In general, it should be noted that Bloomfield's account of premodern linguistics is not reliable. His historical survey consists of a few haphazard remarks that, he asserts, summarize "what eighteenth century scholars knew about language." These remarks are not always accurate (as, for example, his astonishing assertion that prior to the nineteenth century linguists "had not observed the sounds of speech, and confused them with the written symbols of the alphabet" or that the writers of general grammars regarded Latin as supreme in embodying the "universal canons of logic"); and, where accurate, they give little indication of the character of what was done in this period.

The manner in which the sounds of speech were analyzed in this period deserves a separate discussion; it is quite arbitrary to exclude this topic from the present survey, as I have done. Most of the works discussed here, and many others, contain

discussions of phonetics, and the Aristotelian dictum that "spoken words are the symbols of mental experience and written words are the symbols of spoken words" (*De Interpretation*, 1) is apparently accepted with no discussion. There are a few modern references to the phonetics of this period. For example, M Grammont com ments on the phonetics in Cordemoy, op. cit., in the following terms: "…the articulations of a certain number of French phonemes are described with remarkable clarity and precision" (*Traité de phonétique* (Paris: Librairie Delagrave, 1933), 4th edn.(1950), p. 13n.; he goes on to observe that: "These are the descriptions that Molière reproduced word for word in *Le Bourgeois gentilhomme*, acte II, scène 6 (1670)"). [Chomsky developed his views of phonology and phonetics during the late 1950s and early 1960s with his colleague Morris Halle; see Chomsky and Halle 1968. Like his view of 'meanings' (LFs or semantic representations), Chomsky's view of linguistic sounds is that they are "in the head." See in this regard Chomsky 2000, which is a collection of his more recent works on language and mind.]

84 *Grammaire générale*, pp. 340f. Bentham suggests a similar analysis (*Works*, p. 356).

85 A distinction between the "ideas principally expressed" by a linguistic form and the "accessory ideas" associated with it is developed in the Port Royal *Logic*, chaps. XIV, XV. His principal idea is what is stated by the "lexical definition," which attempts to formulate in a precise way the "truth of usage." But the lexical definition cannot "reflect the whole impression the defined word makes on the mind," and "it often happens that a word excites in our minds, besides the principal idea which we regard as the proper meaning of the word, other ideas ideas which we may call accessory ideas and to which though we receive their impression we do not explicitly attend" (p. 90). For example, the principal meaning of *you lied* is that you knew that the opposite of what you said is true. "But in addition to this principal meaning, these words convey an idea of contempt and outrage which suggest that the speaker would not hesitate to harm you a suggestion which renders his words both offensive and injurious." Similarly, Virgil's line *To die, is that such a wretched thing?* (*Usque adeone mori miserum est?*) has the same principal meaning as *It is not so very wretched to die* (*Non est usque adeo mori miserum*), but the original "expresses not only the bare thought that death is not so bad a thing as one supposes but suggests as well the image of a man who challenges death and looks it fearless in the face" (pp. 91 92). Accessory ideas may be "perma nently attached to words," as in the cases just mentioned, or they may be attached only in a particular utterance, for example, by gesture or tone of voice (p. 90). The association may, in other words, be a matter either of *langue* or *parole*.

The distinction is rather like that of cognitive and emotive meaning. Also relevant to contemporary issues is the example (p. 91) of how certain grammatical processes may change the accessory ideas expressed, without modification of principal meaning; thus, so it is claimed, to accuse someone of ignorance or deceit is different from calling him ignorant and deceitful, since the adjectival forms "express, in addition to the idea of particular shortcomings, an idea of contempt, whereas the nouns mean only the particular lack with no accompanying condemnation."

86 C. Buffier, *Grammaire françoise sur un plan nouveau* (1709), cited by Sahlin, *César Chesneau*, pp. 121 122, with typical modern disparagement based, once again, on the assumption that surface structure alone is a proper object of study. See J. Katz and P. Postal, *An Integrated Theory of Linguistic Descriptions*, §§4.2.3, 4.2.4, for devel opment and justification of a very similar idea.

87 "De la construction grammaticale," *Logique et Principes de Grammaire*, p. 229.

88 The Latin example suggests a variety of problems, however. For some remarks on the phenomenon of so called "free word order," within the present context, see Chomsky, *Aspects of the Theory of Syntax*, chap. II, §4.4. [The phenomenon of "case marking" in different languages has proven to be a particularly interesting issue for the linguist constructing a Universal Grammar. See Chomsky, 1986, 1995b, and references provided there.]

89 It is not entirely clear from the context whether these conditions on transformations are regarded as matters of *langue* or *parole*, as conditions on a grammar or on the usage of a grammar; nor is it clear whether, within the framework that Du Marsais accepts, this question can be sensibly raised.

The account of sentence interpretation given by Du Marsais can be profitably compared with that proposed by Katz, Fodor, and Postal in recent work. See Katz and Postal, op. cit., and references cited there. [See also the references in the bracketed addition to Chomsky's note 80.]

90 The examples that I give here are cited by Sahlin as indicative of the ridiculous character of Du Marsais's theory, concerning which "it would be unjust to confront it with modern science so as to reveal the altogether obvious errors in it" (Sahlin, *César Chesneau*, p. 84).

91 T. Reid, *Essays on the Intellectual Powers of Man* (1785). For some remarks and quotations, see Chomsky, *Aspects of the Theory of Syntax*, pp. 199 200.

92 Except to the extent indicated by the final example, the analysis of indefinite articles. Such attempts to go beyond surface form are tolerated by modern linguistic theory and have been the subject of much methodological discussion during the 1940s, particularly in the United States.

93 See Postal, *Constituent Structure* (The Hague: Mouton, 1964), for discussion of contemporary approaches to syntax that accept this limitation. Many modern meth odological discussions actually imply, further, that linguistic investigation should be restricted to the surface structure of the given utterances of a fixed corpus; thus Sahlin reflects modern attitudes in criticizing Du Marsais (p. 36) for the "inexcusable fault on the part of a grammarian" of using invented examples instead of restricting himself to utterances actually observed in living speech, as though a rational alter native were conceivable.

For further discussion of the problem of analyzing deep and surface structure see Chomsky, *Syntactic Structures* (The Hague: Mouton, 1957), *Current Issues in Linguistic Theory, Aspects of the Theory of Syntax*; Lees, *Grammar of English Nominalizations* (The Hague: Mouton, 1960); Postal, "Underlying and Superficial Linguistic Structures," *Harvard Educational Review* 34 (1964); Katz and Postal, *An Integrated Theory of Linguistic Descriptions*; Katz, *The Philosophy of Language*, and many other publications.

94 To mention just one example, consider Harnois's introductory statement in his discussion of "philosophical grammar" ("Les théories," p. 18; it should be empha sized that this discussion is unusual in that it at least pays attention to the actual doctrines that were held by philosophical grammarians, instead of attributing to them absurd beliefs that were completely counter to their actual work). He points out that participants in this work felt themselves to be contributing "a science which had already produced one fundamental work [viz., the Port Royal *Grammar*], namely by

enriching an existing tradition and adding to the numerous results already attained. This opinion may appear ridiculous to a modern linguist, but it was really held."

It should be mentioned that the modern disparagement of traditional linguistic theory develops, not only from the decision to restrict attention to surface structure, but also, quite often, from the uncritical acceptance of a "behaviorist" account of language use and acquisition, common in its essentials to several fields an account that seems to me to be pure mythology. [Note too the quotation from the reprint of Chomsky's review of B. F. Skinner's *Verbal Behavior* in the editor's introduction's note 20.]

95 *Véritables principes de la grammaire* (1729), quoted by Sahlin, *César Chesnau*, pp. 29 30. The dating of this is discussed by Sahlin in the Introduction, p. ix. Much earlier, Arnauld had pointed out that "one has not usually treated as matters of particular grammars what is common to every language" (1669, cited by Sainte Beuve, *Port Royal*, p. 538), and the distinction between general and particular grammar is implicit, though not expressed, in the Port Royal *Grammar*. Wilkins also distinguishes between "natural" (that is, "philosophical," "rational," or "univer sal") grammar, which deals with the "ground and rules as do necessarily belong to philosophy of letters and speech," and "instituted" or "particular" grammar, which deals with the "rules which are particular to a given language" (*Essay*, p. 297).

96 Beauzée, *Grammaire générale*, Preface, pp. v vi.

97 Quoted by Sahlin, *César Chesneau*, p. 21. Note that there is a difference in emphasis in the remarks of Beauzée and D'Alembert on the relation between particular facts and general principles. The two views, however, are not inconsistent.

98 Cf. Sainte Beuve, *Port Royal*, pp. 538f.; Harnois, "Les théories," p. 20.

99 There is, to be sure, an implicit element of so called "prescriptivism" in his choice of "cultivated usage" (that is, the usage of the best authors, but, particularly, "the usage of spoken language" in the Court) as the object of description.

100 Note that a restriction of linguistic study to description without explanation does not entail a corresponding restriction to the investigation of surface structure. The latter is a further and independent limitation. [Compare the restriction to "pure descrip tion" to Wittgenstein's *Blue Book* and *Philosophical Investigations*. It is interesting that Chomsky, like Wittgenstein, holds that it is very likely impossible to construct a science (serious theory) of language use and for parallel reasons having to do with language's creative use (although Wittgenstein did not use this terminology). Chomsky, of course, unlike Wittgenstein, holds that it is possible to construct a science of language (Universal Grammar). For some discussion, see the editor's introduction and McGilvray 1999, 2005.]

101 Vaugelas is by no means the first to insist on the primacy of usage. A century before, in one of the earliest French grammars, Meigret insists that "we must speak in the way that we do speak" and that one may not "make any law against the way French is usually pronounced" (quoted by Ch. L. Livet, *La grammaire française et les grammairiens du XVIe siècle*).

It is interesting to note that the reaction of the Cartesian linguists against pure descriptivism recapitulates the evolution of speculative grammar in the thirteenth century, as an attempt to provide rational explanation in place of a mere record of usage. Speculative grammar also distinguished universal from particular grammar; for example, Roger Bacon assumes that "with respect to its *substance* grammar is

one and the same in all languages, although it does vary *accidentally* (*Grammatica Graeca*, ed. Charles, p. 278, cited in N. Kretzmann, "History of Semantics," in *Encyclopedia of Philosophy*, ed. P Edwards (New York: Macmillan, 1967)).

102 Quoted by Sahlin, *César Chesneau*, p. 26, from the article "Datif" in the *Encyclopedia*. Sahlin also gives (p. 45) a much earlier quote from the *Véritables principes* (see note 95): "Grammar does not come before languages. There is no language that has been based on grammar; the rules [*observations*] of grammarians must be based on usage, and are not laws that have preceded usage." This quote is followed by the comment that Du Marsais did not adhere to this principle, but, though there is much to criticize in his work, I find little evidence to support this charge.

103 This is, of course, consistent with Cartesian methodology, which insists on the necessity of observation and of crucial experiment for choice among competing explanations. See *Discourse on the Method*, part VI. The Cartesian origins of the concern for a "general (universal) grammar" [*grammaire générale*] (expressing what is a common human possession) and an "explanatory grammar" [*grammaire raisonnée*] (which will explain facts instead of merely listing them) are too obvious to require discussion. Similarly, it was the newly rediscovered Aristotelian concept of rational science that led to the speculative grammar of the thirteenth century. Cf. Kretzmann, op. cit.

104 This discussion is due to Arnauld and appears in his correspondence a year before the publication of the *Grammar*. Cf. Sainte Beuve, op. cit., pp. 536f.

The *Grammar* is, incidentally, not entirely fair to Vaugelas in tacitly implying that he was unaware of counter examples. In fact, Vaugelas himself mentions one of the cited counter examples (namely, the vocative, for which he proposes an understood, deleted article). Furthermore, Vaugelas does in fact offer a tentative explanation, rather apologetically, to be sure, for the rule as he formulates it.

105 For further discussion of the matter of explanation in linguistics, see Chomsky, *Syntactic Structures*; "Explanatory Models in Linguistics," in *Logic*, *Methodology and Philosophy of Science*, ed. E. Nagel, P. Suppes, A. Tarski (Stanford: Stanford University Press, 1962); *Current Issues in Linguistic Theory*, and J. Katz, "Mentalism in Linguistics," *Language* 40 (1964), pp. 124 137. [See also Chomsky 1975a, 1975b, 1980, 1981, 1986, 1988a, 1992, 1995b, 2000, 2005, 2007. In a sense, Chomsky's most recent work has gone "beyond explanation" for unlike the state of linguistics in 1966 he can now plausibly hold that the issue of explanatory adequacy as he originally posed it in *Aspects* (in effect, solving "Plato's problem") has been sufficiently settled to move on to other matters. Now he focuses on other explanatory issues matters of computational economy and biological embodiment, some of which bear on the evolution of language and on 'accommodating' language to biology. See the editor's introduction. Incidentally, it is illuminating to compare Chomsky's view on innateness with Humboldt's.]

One of the most striking features of American descriptivism in the 1940s was its insistence on justification in terms of precisely specified procedures of analysis. The emphasis on precision and on the necessity for justification of descriptive state ments in some language independent terms constitutes a major contribution. But the requirements that were placed on justification (namely, that it be "procedural," in the sense of the methodological discussions of the 1940s) were so strong as to

make the enterprise unfeasible, and some of the reactions to this stringency (in particular, the view that any clearly specified procedure of analysis is as good as any other) detracted substantially from its potential significance.

106 Observe, however, that the discussion in the Port Royal *Grammar*, if interpreted quite literally, does not identify the underlying structures with actual sentences. Cf. pp. 83 84 above, and note 73. It is thus quite close, in conception, to transforma tional generative grammar of the sort developed in the references of note 93, which has also been based on the assumption that the structures to which transformational rules apply are abstract underlying forms, not actual sentences. Notice, incidentally, that the theory of transformations as originally developed by Harris, outside of the framework of generative grammar, does regard transformations as relations among actual sentences and is, in fact, much closer to the conception of Du Marsais and others, in this respect (see Z. S. Harris, "Co occurrence and Transformation in Linguistic Structure," *Language* 33 (1957), pp. 283 340, and many other refer ences). See Chomsky, *Current Issues in Linguistic Theory*, p. 62n., for some discussion bearing on this point.

107 Humboldt's picture was, however, a good bit more complex. Cf. pp. 69 73 above.

108 Notice that, when described in these terms, linguistic universals need not be found in every language. Thus, for example, when a certain set of phonetic features is claimed to constitute a universal phonetics, it is not proposed that each of these features functions in every language, but rather that every language makes its particular choice from among this system of features. Cf. Beauzée, op. cit., p. ix: "the necessary elements of language… are in fact present in all languages, and their necessity is indispensable for the analytic and metaphysical exposition of thought. But I do not intend to speak of an individual necessity, which does not leave anyone free to reject any idiom; I mean to indicate only a specific necessity [*une nécessité d'espèce*], which sets the limits of the choices that one can make." [This view of a mind's 'choice' among phonetic features anticipates Chomsky's later (early 1980s) principles and parameters approach to the 'choices' a child's mind makes in acquiring a language. For discussion, see the editor's introduction.]

109 Translated by M. H. Carré (1937), University of Bristol Studies, No. 6.

110 These developments are familiar except, perhaps, for seventeenth century English Platonism. See A. O. Lovejoy, "Kant and the English Platonists," in *Essays Philosophical and Psychological in Honor of William James* (New York: Longmans, Green, 1908), for some discussion of English Platonism, in particular, of its interest in the "ideas and categories which enter into every presentation of objects and make possible the unity and interconnectedness of rational experience." Lovejoy's account, in turn, is based heavily on G. Lyons, *L'idéalisme en Angleterre au XVIIIe siècle* (Paris, 1888). See also J. Passmore, *Ralph Cudworth* (Cambridge: Cambridge University Press, 1951); L. Gysi, *Platonism and Cartesianism in the Philosophy of Ralph Cudworth* (Bern: Herbert Lang, 1962). Some relevant quotes from Descartes, Leibniz, and others are given in Chomsky, *Aspects of the Theory of Syntax*, chap. 1, §8, where the relevance of this position to current issues is also briefly discussed. [Chomsky notes in *CL*'s conclusion (p. 107 below) that some figures have been omitted from his survey of 'Cartesian linguists', or have been inadequately discussed. He mentions Immanuel Kant in particular. It is perhaps significant that the Cambridge Platonists had more to say about the scientific issues

of language acquisition that Chomsky discusses than Kant, who was primarily interested in epistemological issues and had little to say that could be seen as anticipating Chomsky's 'biologizing' of language.]

See also Chomsky, *Explanatory Models in Linguistics*, and Katz, *Philosophy of Language*, for discussion of an essentially rationalist approach to the problem of language acquisition and of the inadequacy of empiricist alternatives. In the same connection, see Lenneberg, "Biological Perspective," and *Biological Foundations of Language* (New York: John Wiley, 1967), and §VI of *The Structure of Language: Readings in the Philosophy of Language*, ed. J. Fodor and J. Katz (Englewood Cliffs: Prentice Hall, 1964). [See also Jenkins 1999 and several of the chapters of McGilvray 2005, plus references in both. Biolinguistics remains a burgeoning field of study. A particularly good starting point is Hauser, Chomsky, Fitch 2002; a very useful overview is found in Chomsky (2007 and forthcoming); some more technical discussion is in Chomsky 2005.]

111 Leibniz, *Discourse on Metaphysics*. The quotations here are from the English translation in *Leibniz: Discourse on Metaphysics and Correspondence with Arnauld*, trans. G. Montgomery (La Salle: Open Court, 1902). With reference to Plato's theory, Leibniz insists only that it be "purged of the error of pre existence." Similarly, Cudworth accepts the theory of reminiscence without the doctrine of preexistence that Plato suggests as an explanation for the facts he describes: "And this is the only true and allowable sense of that old assertion, that knowledge is reminiscence; not that it is the rememberance of something which the soul had some time before actually known in a pre existent state, but because it is the mind's comprehending of things by some inward anticipations of its own, something native and domestic to it, or something actively exerted from within itself" (*Treatise concerning Eternal and Immutable Morality*, p. 424; page references, here and below, are to the first American edition of works of Cudworth, vol. II, T. Birch, ed., 1838). [The quotation is found on p. 74 of Sarah Hutton's recent edition of the *Treatise* (Cudworth 1996). References to this text have been added to Chomsky's references below and in the text.]

Leibniz's view (*Discourse on Metaphysics*, §26) that "the mind at every moment expresses all its future thoughts and already thinks confusedly of all that of which it will ever think distinctly" might be regarded as suggesting the fundamental insight regarding language (and thought) that we discussed in §2.

112 Cf. Beauzée, *Grammaire générale*, pp. xv xvi. He defines "grammatical meta physics" [*la Métaphysique grammaticale*] as being nothing but "the nature of language brought into the open, established in its own terms, and reduced to general notions":

> The fine points that this metaphysics discovers in language…come from eternal reason, which unconsciously directs us… It would be vain to claim that those who speak the best are not aware of these delicate principles. How could they put them into practice so well unless they were somehow aware of them? I admit that they would perhaps not be ready to use all the rules in their reasoning, because they have not studied them systematically [*l'ensemble et le système*]; but in the end, since they apply these principles, they are conscious of them within themselves; they cannot escape from the imprints of this natural logic which, covertly but irresistibly, directs honest minds in all their operations. But general grammar is simply the rational exposition of the procedures of this natural logic.

113 But cf. p. 97 above. The typical Cartesian view would apparently have been that, although these principles may function unconsciously, they can be brought to consciousness by introspection.

114 But whatever trouble we take to teach them certain things, we often find that they know the names of a thousand others that we did not intend to show them; and, what is more surprising, we see that when they are two or three years old they are capable, through the mere force of their attention, to distinguish the name we give to a thing in all the constructions we use in speaking about it. (pp. 47 48)

He also points out that children learn their native language more easily than an adult can learn a new language.

It is interesting to compare these quite commonplace but perfectly correct observations with the picture of language learning that one generally finds among many modern writers, whose conclusions are, in fact, based not on observation but on a priori assumptions about what they believe must take place. Cf., e.g., the speculation on how all language "habits" are built up by training, instruction, conditioning, and reinforcement in Bloomfield, op. cit., pp. 29 31; Wittgenstein, *Blue Book* (Oxford: Blackwell, 1958), pp. 1, 12 13, 77; Skinner, *Verbal Behavior* (New York: Appleton Century Crofts, 1957); Quine, *Word and Object* (Cambridge and New York: M.I.T. Press and John Wiley, 1960); etc. [See also the editor's introduction.]

Occasionally, modern discussions invoke some process of "generalization" or "abstraction" that functions along with association and conditioning, but it must be emphasized that there is no known process of this sort that will begin to overcome the inadequacy of empiricist accounts of language acquisition. For discussion, see the references in note 110. In considering this problem, one must, in particular, bear in mind the criticism advanced by Cudworth (*Treatise*, p. 462; Cudworth 1996:114 116) against the attempt to show how general ideas might arise from sensory images (phantasms) by "abstraction" and thus require no postulation of innate mental structure. As he points out, the *intellectus agens* either "doth know what he is to do with these phantasms beforehand, what he is to make of them, and unto what shape to bring them," in which case the question is begged, an "intelli gible idea" being presupposed; or, if he has no such plan, "he must needs be a bungling workman," that is, the act of "abstracting" can lead to any arbitrary and absurd result.

In short, reference to "generalization" does not eliminate the necessity to provide a precise account of the basis on which acquisition of beliefs and knowledge proceeds. We may, if we like, refer to the processes involved in language acquisition as processes of generalization or abstraction. But we will then apparently be forced to conclude that "generalization" or "abstraction," in this new sense, has no recognizable relation to what is called "generalization" or "abstraction" in any technical or well defined usage of philosophy, psychology, or linguistics.

115 Cf. Steinthal, *Gedächtnissrede*, p. 17. He holds that Humboldt's fundamental insight was to see "how nothing external could ever find its way into the human being if it were not originally in them already and how all external influence is only a stimulus for the bursting forth of the inwardness. In the depth of this inwardness lies the unitary source of all genuine poetry and genuine philosophy,

the source of all ideas and all great human creations, and from this source, language too flows."

Humboldt's views on education, incidentally, illustrate the same concern for the creative role of the individual. In his early essay against state absolutism (see pp. 66f. above), he argues that "sound instruction undoubtedly consists of spreading out before the person to be instructed various solutions, and then preparing him to choose the most appropriate, or even better, to invent his own solution by simply arranging before him all the difficulties to be conquered." This method of instruction is, he maintains, not available to the state, which is limited to coercive and authoritarian means. (Cf. Cowan, *Humanist*, p. 43.) Elsewhere he holds that "all educational development has its sole origin in the inner psychological constitution of human beings, and can only be stimulated, never produced by external institutions" (Cowan, p. 126). "Man's understanding, like all his other energies, is cultivated only by each human being's own activity, his own inventiveness, or his own utilization of the inventions of others" (Cowan, pp. 42 43). Cf. also Cowan, pp. 132ff.

It is interesting to compare Harris's observation in his *Hermes* that there is "nothing more absurd than the common notion of Instruction, as if Science were to be poured into the Mind like water into a cistern, that passively waits to receive all that comes. The growth of knowledge … [rather resembles] … the growth of Fruit; however external causes may in some degree cooperate, it is the internal vigour, and virtue of the tree, that must ripen the juices to their just maturity" (*Works*, p. 209). Here the ideal is apparently Socratic method; as Cudworth describes it (*Treatise*, p. 427; Cudworth 1996: 78), the belief that "knowledge was not to be poured into the soul like liquor, but rather to be invited and gently drawn forth from it; nor the mind so much to be filled therewith from without, like a vessel, as to be kindled and awaked."

116 On the relation between Cudworth and Descartes, see Passmore, op. cit.; Gysi, op. cit.; and, for more general background, S. P. Lamprecht, "The Role of Descartes in Seventeenth century England," *Studies in the History of Ideas*, vol. III (New York: Columbia University Press, 1935), pp. 181 242. Passmore concludes (*Ralph Cudworth*, p. 8) that, despite some divergence, "it is still not misleading to call Cudworth a Cartesian, so great was their agreement on so many vital issues."

117 Cf. Descartes, Meditation II, CSM, 21: we know what it is that we see not "from what the eye sees" but "from the scrutiny of the mind alone."

> But then if I look out of the window and see men crossing the square … I normally say that I see the men themselves … Yet do I see any more than hats and coats which could conceal automatons? I judge that they are men. And so something which I thought I was seeing with my eyes is in fact grasped solely by the faculty of judgement which is in my mind.

118 However, "the cogitations that we have of corporeal things [are] usually both noematical and phantasmatical together." This accounts for the fact that geometri cians will rely on diagrams and that "in speech, metaphors and allegories do so exceedingly please" (pp. 430, 468; Cudworth 1996: 81 (for quotations), 121 (for geometrician reference)).

119 In a similar way, Cudworth arrives at the typical rationalist conclusion that our knowledge is organized as a kind of "deductive system" by which we arrive at "a descending comprehension of a thing from the universal ideas of the mind, and not

an ascending perception of them from individuals by sense" (p. 467; Cudworth 1996:120, cf. 113 114).

120 See Abrams, *Mirror*, for discussion of the importance of this theory of cognitive processes in romantic aesthetics, and of its origins in earlier thought, particularly, that of Plotinus, who "explicitly rejected the concept of sensations as 'imprints' or 'seal impressions' made on a passive mind, and substituted the view of the mind as an act and a power which 'gives a radiance out of its own store' to the objects of sense" (p. 59). Parallels between Kant and seventeenth century English philosophy are discussed by Lovejoy, *Kant and the English Platonists*.

121 Quoted in A. D. Snyder, *Coleridge on Logic and Learning* (New Haven: Yale University Press, 1929), pp. 133 134.

122 Quoted in Snyder, *Coleridge*, p. 116.

123 See, for example, D. M. MacKay, "Mindlike Behavior in Artefacts," *British Journal for Philosophy of Science* 2 (1951), pp. 105 121. J. S. Bruner, "On Perceptual Readiness," *Psychological Review* 64 (1957), pp. 123 152, "Neural Mechanisms in Perception," *Psychological Review* 64 (1957), pp. 340 358. For a review of many of the findings relating to central processes in perception, see H. L. Teuber, "Perception," in the *Handbook of Physiology, Neurophysiology*, ed. J. Field, H. W. Magoun, V. E. Hall (Washington: American Physiological Society, 1960), vol. III, chap. LXV. [Scientific research on perception since 1966 continues this theme; the literature is now massive. Chomsky sometimes refers to Marr 1981.]

124 For discussion and references in the areas of phonology and syntax respectively, see M. Halle and K. N. Stevens, "Speech Recognition: A Model and a Program for Research," in Fodor and Katz (eds.), *Structure of Language*; and G. A. Miller and N. Chomsky, "Finitary Models of Language Users," pt. II, in *Handbook of Mathematical Psychology*, ed. R. D. Luce, R. Bush, and E. Galanter (New York: John Wiley, 1963), vol. II.

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Index

accommodation of linguistics to biology 18, 19, 24 35
  progress in 25, 35
acquisition of language 14, 30, 98 106, 144
  empiricist accounts of 21, 144
  internalized rules and 107
  and Platonism 100, 101 102
  preconditions for 107
  rationalist approach to 143
  third factor considerations 33
adverbs 86, 88
animal language 63, 64, 69, 120, 124
appropriateness of linguistic actions 43 44, 61, 70, 120
Arnauld, A. 87, 140
art 68, 94, 102, 125 126

Beauzée, N. 88, 89, 93 94, 96
Bentham, J. 131
biolinguistics 4, 24 35
biology
  accommodation of linguistics to 18, 19, 24 35
  Goethe's 'Urform' 72 73
  growth 33
Bloomfield, L. 65, 123, 126, 137
body and mind distinction 79
Bougeant, G. H. 63 64

Cartesian linguistics 57, 58, 76, 118
case systems 87
children 5, 15, 28
  acquisition of language 14, 15, 16, 17, 23, 101 102, 144
  linguistic creativity 7
Chomsky, Noam 18 24
  politics 51
cognition 4, 34, 103, 104
  Descartes's theory of 103, 104, 121
cognitive science 12, 23
Coleridge, S. T. 72, 105, 128
combinatory principles of language 16, 18
commands 88
Common Notions 98, 99, 100
common sense 20, 36, 37, 112, 115
communication 71, 76, 120, 124
concepts 10, 16, 18
  computer modeling of 24
  innate 7, 37, 45, 46
  lexical 14
  naturalistic theories of 22
  sentential 14
conjunctions 89
connectionism 23, 110, 113
Cordemoy, Géraud de
  creative use of language 125, 133
  language acquisition 101, 133
  mind 61 63, 79
Cowan, M. 73
creative use of language 4, 38 45, 59 77, 109, 125
  central role in human affairs 4
  enjoyment of 9
  explanation of 13
  linguistics and 1, 2, 4, 6 18, 107
  and meaning 8
  reason and 34, 35
  science and 115
creativity 50, 68, 75, 133
Cudworth, R. 102 105, 143, 144

D'Alembert, J. 94
data analysis, principles of 33
deep structure and surface structure 26, 27, 78 92, 97
  the Port-Royal grammarians and 26, 96, 134
democracy 52
denotation 8
Descartes, René 1, 36 48, 109
  animals and machines 38 40, 59, 65, 113
  contact mechanics 38, 44, 59, 61 63, 115
  creative use of language observations 4, 38 45, 125
  function of language 124

ideas 37, 45, 134
language 61, 65, 66
mind 38 40, 44, 45 48, 60, 119
poverty of the stimulus observations 65, 116
reason 20, 41, 60, 66, 67
science 36 38
tests for other minds 38 40, 65, 66, 114
theory of cognition 103, 104, 121
descriptivism 140, 141
determinations 82, 84, 96
Diderot, D. 131
dispositions 65
Du Marsais, César Chesneau 87
grammar 88, 93, 95, 96
semantic interpretation 139
theory of construction and syntax 89 91, 97

education 48 52, 145
empiricism and 49
ellipsis 90, 134
empiricism 22, 110
and the creative use of language 1, 33
and education 49
externalism 16
and human nature 48
language acquisition 16, 20, 21
methodological dualism 22, 23
and mind 4, 6, 16, 18, 23, 110
perception 105
study of cognition 23
Enlightenment views 50
evolution and development 33
experience 100, 102
explanation 27, 93 97, 107, 119, 123, 141

Fitch, Tecumseh 32
Fodor, Jerry 12, 22, 110
form, mechanical and organic 72, 74 75
Foucault, Michel 109, 112
free will 2, 35, 61, 66
freedom 2, 50, 51, 130
Humboldt on 73, 130
of thought 76

Galileo, Galilei 36, 125
generalized learning procedures 16, 17, 21, 144
generative grammar 57, 69 70, 75, 105, 107, 118, 136
generative processes 69, 71, 75
generative theory of language 26, 41, 42, 70
geometrical figures 104
Goethe, J. W. von 33, 72 73
Gould, S. J. 34
government 49, 51, 73

grammar
adequacy of 28
descriptive 93
formalized 27
general and particular 93 94, 98
generative 57, 75, 107, 118, 136
philosophical 94, 95, 96, 97, 98, 118, 139
phrase structure 27, 29, 86
universal grammar: *see* universal grammar
gravitation 44
growth 33

Harnois, G. 139
Harris, James 67, 71, 78 79, 124 125, 127 128, 145
Hauser, Marc 32
Herbert of Cherbury 98, 99 100
Herder, J. G. 66, 67, 112
Herman, Edward 52, 117
Hockett, C. F. 65, 123 124
Huarte, Juan 109, 121 122, 131
human evolution 34, 48
human nature 50, 51, 66, 123 124
Humboldt on 73, 74
science of 35, 52
human needs, fundamental 51
human rights 74
Humboldt, Wilhelm von 58, 69 72, 144
articulation 126 127
character of language 74, 75
education 50, 145
form of language 69 70, 71, 72, 73, 74 75, 98, 128
freedom 73, 130
human nature 73, 74
language acquisition 101 102
natural languages 129
perception 105 106
Platonism 101 102
social and political theory 73 74
thought 76
Hume, David 110

I-language 47, 117
ideal types 134
ideas 81, 89, 104, 134, 135; *see also* concepts
imperatives 88
indefinite articles 91
indirect discourse 84
indoctrination 49
information
meaning information 13
semantic 14
sound information 13

innate concepts 7, 37, 45, 46
innate processes 20, 28, 49, 100, 103
innovation 42, 61, 62, 75, 95, 120; *see also* creative use of language, creativity
instincts 66, 67, 99
intellectuals 117
internalism 6 18, 45
interrogation 85, 88, 134

Kant, Immanuel 50, 105, 107, 142
Katz, J. J. 137
Kauffmann, Stuart 33

La Mettrie, J. O. de 61, 65, 77, 133
Lamy, B. 75, 79, 87, 95, 135
language
  animal language 64, 69, 120, 124
  appropriateness of linguistic actions 43 44, 61, 70, 120
  articulation 126 127
  combinatory principles 16, 18; *see also* transformational rules
  computer modeling of 24
  evolution and development of 33, 34, 119
  inner and outer aspects of 79, 84 86
  mechanical explanation of 61, 62, 63
  natural order in 132
  novelty, coherence and relevance of 61
  patterns and dispositions in 76
  poetical quality of 68
  principles of 93, 101, 106
  rationalist romantic strategy for investigating 15, 18, 118
  stimulus-free character of 60, 65, 66, 67, 68, 76, 120
  structure of 93, 97, 107
  and thought 77, 78
  unboundedness 39, 42, 60, 68, 120
language competence 118, 119
language faculty 49, 50, 59, 103, 115; *see also* innate processes
language structure 93, 107
Latin, replacement with the vernacular 77
learning, theory of 102, 103
Leibniz, G. W. 100 101, 143
Lewis, David 11
Lewontin, R. C. 34
lexicon 14, 70
  I-language 47
linguistics 1, 107, 140
  accommodation to biology 18, 19, 24 35
  descriptive 93 97
  development of 108
  explanation in 93 97, 141
  history of 57
  Humboldt's theory of 69 72
  minimalist program 25, 29, 32, 119
  modern 74, 92
  premodern 137
  progress in 19 20
Loebner competition 40 41

mathematics 11, 36
meaning 8, 11, 13, 81
  cognitive and emotive 138
  internalist theory of 14
  and reference 96
  theory of 13
media, corporate-run 52, 117
mental entities 6, 107; *see also* concepts, ideas, mind
Merge operation 29, 32, 42, 119
methodological dualism 21, 22, 23
Mill, J. S. 132
mind 1, 3, 18, 38, 104, 121, 128
  computational theory of 45 48
  creativity and 45
  and deep structure 91
  Descartes and 44, 60, 61
  empiricist view of 23
  and the external world 15
  internalist study of 3
  and language 76, 77, 98
  mind body problem 45, 79
  modularity of 42, 43
  other minds 40 41, 61 63, 65, 66, 114
  perception and volition 78
  philosophy of 102
  rationalist romantic view of 4, 15
  rationalist theory of 98
  representational theory of 12, 110
  romantic theories of 118
  science of 1, 6 35
  spontaneity of 69
morphogenesis 33
Morris, William C. 111

names, proper, as rigid designators 9
nativism 3, 6 18, 45, 110
natural languages 131
  case systems 87
  concepts expressed in 16
  deep structure and surface structure 87, 88
  meaning 12
  proper names 10
  reference 9
  rules or principles 29
  structures of 29, 129
  universal features of 142
natural rights 73, 129, 130

neural nets 16, 22, 23, 110, 111, 113
Newton, Isaac 44, 45
Nim Chimpsky 40
nouns 8, 9, 83, 96

parameters 30 33, 47
perception 78
perception, theory of 102, 103, 104 105, 106, 116
philosophy 8, 115
phrase structure grammar 27, 29, 86
Platonism 100, 101 102, 142, 143
Plato's Problem 14, 27, 28, 29
  solution to 30, 31, 32, 33
poetry 68 69, 125
political institutions 51, 52
political theory 73 74
politics 48 52
Port-Royal *Grammar* 25, 26, 84 86, 94, 95, 96
  adverbs 88
  case systems 87
  deep structure and surface structure 26, 86, 134
  propositions 79 81
  relative clauses 83, 96
  syntax 78
  verb systems 83
Port-Royal *Logic* 81, 86, 87
Postal, P. M. 137
poverty of the stimulus observations 2, 3, 5, 22, 46, 120
  and creativity observations 4, 6 18, 24
  Descartes and 65, 116
  language 5
power 49, 51, 73
primates, language and 40
problem solving 37
progress 19 20
pronouns, relative 83
propositions 79 81, 83, 135
  and deep structure 80
  essential and incident 81
Proudhon, P.-J. 132
psychology 2, 98, 100, 102, 107

questions 85, 88, 134
Quine, W. V. O. 22, 112

rationalism 1, 102, 110
rationalist romantic strategy for investigating language 4, 6, 13, 22
  educational implications of 50
  political implications of 50
reason 34, 35, 50, 67, 87
  Descartes and 20, 41, 60, 66, 67
  politics and 50
  Schlegel and 101
recursion 32, 34, 42, 85, 119, 120
reference 8, 9, 12, 81, 96
relative clauses 80, 81, 83, 95
  explicative 82, 83, 84
  restrictive 82, 83, 84
  Vaugelas's rule 95, 96
rights, human 74
rights, natural 73, 129, 130
romanticism 1, 6, 72, 76, 101, 105, 146
Rousseau, Jean-Jacques 130 131
Russell, Bertrand 115
Ryle, Gilbert 64, 65

Schlegel, A. W. 67 69, 72, 101, 124, 127
  art 125 126
  mechanical form and organic form 72
  poetry 125
Schlegel, Friedrich 76
science 3, 11, 94, 96; *see also* theories
  and common sense, 19, 112
  of evolution 33
  of language 2, 4, 6 35, 41, 140; *see also* linguistics
scientific method 2, 18, 24, 36, 46
self-expression 70, 71, 76
self-realization 73, 130
Sellars, W. 12, 22, 112
semantics 11, 12, 15, 136, 137, 139; *see also* meaning
sentences 14, 62, 75, 76
simplicity 19, 30, 37, 113
social organization 35, 51, 130
social theory 73 74
speech
  interpretation of 105 106
  perception of 89, 91, 137
structuralism 74
syllogisms 87
syntactic principles
syntax 14, 78, 85, 89 91, 139

theories
  conditions of adequacy 20
  construction of 37
  descriptive adequacy of 19, 27, 30, 37
  explanatory adequacy of 19, 27, 37
  formalization of 19, 27, 37
  objectivity of 19
  progress 19
  simplicity of 19, 30, 37, 113
Thompson, D'Arcy 33
thought 20, 70, 77, 78, 88
  forms of 85
  judgment and 76 77, 79
training 49, 101, 122

transformational generative grammar 83, 107, 136
transformational rules 27, 81, 83, 89, 92, 142
Turing, Alan 33, 40, 114

unboundedness 39, 42
universal grammar 5, 21, 28, 30, 32
  Port-Royal grammarians 26, 78, 96, 98, 107, 118

Vaugelas, Claude Favre de 95, 96, 141
verbs 83, 86, 136
vision 3, 46 47, 116
volition 78

Waddington, Charles 33
Wilkins, J. 76, 140
Wittgenstein, Ludwig 12, 20, 140
word order 76, 90