

KNOWLEDGE OF HISTORY AND THEORY CONSTRUCTION  
IN MODERN LINGUISTICS \*

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The questions that have been suggested to me are very interesting ones<sup>1</sup>. They have to do with the place of the study of language within the Human Sciences generally, both today and throughout its history. It's a long history, which goes back to classical India and Greece, and it is a history which, in my opinion, is both important and very poorly understood, up until today. I have also been asked to talk about the questions from a more personal view: how did I become interested in these topics myself? — Actually, along with a few other friends and colleagues in the same years, most of us around Cambridge, Massachusetts, graduate students. In my case it was about fifty years ago.

One could approach these questions in various ways. One way would be to describe the actual facts, what actually happened. How did the long and rich history of intellectual achievement come to play a role in contemporary work, to the extent that it did? A second and more interesting way to approach the question would be to ask how things should have happened, in a more rational world than the one we live in. The first, the actual sequence of events, is not in itself very interesting in my opinion; it is a story that has never been told properly, and as is usual in the real world, it's a story of chance events and personal accidents, accidents of personal history. The second question, namely, how it should have happened, is far more interesting and important, and that certainly has never been told or even investigated. Also of some interest is the difference between what actually did happen and what should have happened, in a more reasonable world. That difference tells us something about the intellectual climate in the United States and much of the rest of the world in the mid-20th century, and that leads to some explorations of the social and political origins of this

\* This paper goes back to the lecture given on 22 November 1996 in the Auditorium of the Faculdade de Arquitetura of the University of São Paulo, which was to address the question of the "Use of History for Theory Construction in Modern Linguistic Science". I would like to register the collaboration of Angela Ribeiro França in the transcription of the original tapes and, specially, the assistance of Noam Chomsky himself with the final version of the text. Remaining shortcomings are my responsibility. Cristina Altman

<sup>1</sup> I would like to thank the Department of Linguistics at the University of São Paulo, and particularly the *Historiography of Linguistics Project*, for the invitation and the challenging questions that were posed for discussion. Noam Chomsky

climate. This is also an interesting topic, a largely untold story and, in fact, one that is unexamined, though a very interesting part of the contemporary history, as it has unfolded since the Second World War. And a history that is very instructive, I think. I'd like to say a few things about several of these topics, interweaving the actual and the ideal, — meaning what actually happened and what should have happened.

For the whole History of Linguistics, there is good scholarly work on particular points, but often misunderstanding much what happened, in my opinion. Since the phrase 'Cartesian Linguistics' came up, I should mention that there are two versions of 'Cartesian Linguistics': one is the book that I wrote; another is a mythology that has been created about it. The mythology is the only thing that has ever been discussed, except in really serious scholarship. The mythology is based on the title. There are lots of articles called 'the non-existence of Cartesian Linguistics' and so on, all of which I agree with (cf. Koerner & Tajima 1986:24-26). And if the readers have gotten to page 2 of the book, they would have understood why. The title is 'Cartesian Linguistics', but by page 2, I explain that Descartes (1596-1650) had virtually no linguistics. There were some ideas, which were developed in various ways, including development by people who were very anti-Cartesian, and not at all in his tradition. I'm looking at the ideas. I don't care what the person who expresses the ideas had for breakfast that morning, or read yesterday and so on, but rather how the ideas developed in many different traditions. If you look at the ideas, you find serious continuity. One of the problems of intellectual history in my opinion, although is called the History of Ideas, it often pays little attention to ideas. What it pays attention to is other things, like 'influences', and 'who spoke to whom', and so on and so forth. That often gives you a very misleading account of how ideas developed. You can see this in your own current work. I mean, if people try to develop the history of work that I know very well, since it's my own work, on the basis of the books in the library and whom I spoke to, and so on and so forth, one would have a very distorted picture. There are certain ideas that come up, and get changed, and get modified, and, unless you look at those ideas, you don't really understand History of Ideas. But that's often not the way the topic is approached. As I say, the phrase 'Cartesian Linguistics' does not mean, when I used it, "the Linguistics of Descartes", which does not exist, but rather the study of language, psychology, and related topics, that developed within a more or less Cartesian framework. So Rousseau (1712-1778), for example, is not considered a Cartesian. Of course he isn't. He is a leading figure of Romanticism. But if you really think through what he

wrote, some of it is based on strict Cartesian principles, which had worked their way into French intellectual tradition and which he used, probably unconsciously, to develop social and political theories. That's the History of Ideas, but it's often not the way Intellectual History is done. There are certain differences of approach, let's say.

I want to say a few words about several of these topics æ I'm not going to do it systematically, and will be interweaving the *actual* history and the *ideal* history, what should have happened æ looking at a few particular examples to illustrate. Let me begin with a very current one.

Over the years, there have been many occasions on which old ideas and insights, long forgotten, have been recovered, or revived, rediscovered, or reshaped in various ways. One very recent case was just a few months ago, when the MIT Press published a very interesting work on lexical semantics. This book, called *The Generative Lexicon*, was written by a linguist and specialist in computer sciences, named James Pustejovsky. He develops ideas about the meaning of words, which were proposed by a philosopher and classical scholar, my personal friend Julius Moravcsik. He and I were graduate students together, and Moravcsik derives these ideas directly from the Aristotelian theory of *aitia* æ in English usually translated as "causes", the 'Aristotelian causes'. "Generative factors", "factors that generate things" would be a more reasonable translation of *aitia*. Moravcsik restates these Aristotelian ideas æ which are metaphysical, they have to do with the structure of the world æ in cognitive terms, as what he called 'Aitiational Semantics' (Moravcsik 1975), Semantics based on the Aristotelian 'theory of *aitia*'. That was a good idea and it happens to fit very well into completely independent, but quite important developments in the study of language and mind, that took place in the rationalist Philosophy inspired by Descartes in the 17th and 18th century, and also in the British empiricist tradition, from Thomas Hobbes (1588–1679) to David Hume (1711–1776).

Here again the standard historiography is misleading in my opinion. The major figure of British empiricism is John Locke (1632–1704), but his view of language æ which shifted the study of language in England from a study of the relation between words and things to a study of the relation between words and ideas, a mentalistic cast which was crucially important æ was heavily influenced by the Port-Royal Grammar (which has, among other sources, strong Cartesian influences; Antoine Arnauld (1612–1694), one of the leading figures, was an important Cartesian) and was also

influenced by British Neoplatonism — particularly Ralph Cudworth (1617–1688) who was in the environment — and also it derives from rationalist sources. The rationalist and empiricist traditions are much more interlinked, when you look at their content, than standard history courses or history books would lead one to believe.

In the 17th and 18th century, this intricate complex of rationalist Psychology and Philosophy, and British empiricist Psychology and Philosophy, developed important ideas about Lexical Semantics, among other things. It has intriguing relationships with the kind of Semantics that Moravcsik suggested, by adapting the traditional metaphysical theory of *aitia* in Aristotle, and now with Pustejovsky's recent book. The book is well known and influential in an area with a good deal of constructive work and controversy, but the origins are not very well known, although in this case, they are known by at least a few people, including the ones I mentioned. That's one of the rare cases in which rediscovery was conscious. That is, it was an act of conscious awareness of traditional ideas, that were reshaped into an approach to Lexical Semantics, which in my view is very productive and probably the correct approach.

This work on the Generative Lexicon is part of the more general field called Generative Grammar, which is intended to cover the study of language quite generally: the study of form and meaning, the study of structure of language, all areas of phonology and morphology, syntax, semantics, pragmatics, and so on. This study took shape from the late 1940s, and it took place in complete ignorance of the history. I can attest to that, personally. There was no knowledge of the history, either on my part, or on the part of anyone in the field at that time. If they knew it, it was so deep in their minds that it never came to the surface. And that, in fact, is kind of interesting.

Early Generative Grammar, from the late 1940s, in fact revived and reshaped ideas that had received perhaps their richest expression in India, 25 hundred years earlier, in the tradition of Panini, the famous Indian grammarian. In part, Generative Grammar revived and reshaped ideas that had developed in the scientific revolution of the 17th century, with many ramifications in the study of language and mind, in social and political thought and also in action. Ideas that fed into the French Revolution and the American Revolution and other developments, including the nationalist revolutions, the anti-colonial revolutions in South America. By now, some of these connections are familiar. At least there is some work going on. At the time,

all this was completely unknown. There has by now been some important scholarly work on classical Indian grammar, informed by quite contemporary perspectives. There has also been some investigation of the 17th and 18th century tradition, much of it extremely misleading in my view, for the reasons I indicated, but some of it quite serious. At least the texts are now available. Thirty or forty years ago, I had to go to the British Museum to find standard texts, which didn't exist in the United States. By now they are available and there are some good scholarly studies, although the topics are still very poorly known and poorly understood, in my opinion.

At the time, however, going back to the 1940s, ignorance was total, and in fact, rather remarkable. I'll shift for a moment to a personal perspective. I started working on these topics in the late 1940s, when I was 17 or 18 years old, an undergraduate at the University of Pennsylvania. Fortunately for me I had very little background in linguistics, or anything else. So, I came to it without any prejudices, just doing what seemed sensible. And what seemed sensible was Generative Grammar. The main undergraduate work that I did, mostly on my own, was on a Generative Grammar of a language that I knew, Modern Hebrew. Instead of doing it the way we were taught, Structural Linguistics, which didn't seem to me to make much sense, I did it in just the way that seemed natural, and wrote a detailed Generative Grammar of Modern Hebrew (Chomsky 1951), concentrating mostly on morphology and phonology, which it turns out is very much like the kinds of grammatical work that Panini had done on Sanskrit, 25 hundred years earlier. The faculty where I was was a very distinguished one, with some of the leading linguists in the country, in the world. One of them was a well known semitist, as well as the leading theoretician in modern American structural linguistics<sup>2</sup>. Another was a prominent historical linguist, also a scholar of the Indic tradition<sup>3</sup>. None of them pointed the connections out to me, and I don't think they were aware of them, although in some corner of their minds, they must have been.

The leading figure in American Linguistics at the time, the grand master, was Leonard Bloomfield (1887–1949). Bloomfield was a very interesting person, the founder of modern American linguistics, Structural Linguistics. The Faculty members in my University were all students and friends of his.

<sup>2</sup>Zellig Harris (1909-1992)

<sup>3</sup>Henry Hoenigswald (b.1915)

But Bloomfield seems to have been schizophrenic. He was an American linguist, deeply rooted in logical positivism, behaviorism, all the fashionable ideas of the day, considered to be hard science. But in some other corner of his mind, he was a traditional scholar who happened to be very well versed in Indic studies. He certainly knew the Paninian tradition. In fact, in 1939, Bloomfield wrote a generative grammar of Menomini, an American Indian language, very much in the style of Panini. That work, even though he was the leading American linguist, was not known in the United States, except to his immediate students. In fact, when he died a few years later and there was a comprehensive study of his work on Algonkian languages, done by one of his main students, this was omitted.<sup>4</sup> It wasn't even listed. He actually published that article in the *Travaux du Cercle Linguistique de Prague*, in Czechoslovakia (Bloomfield 1939).

I didn't know Bloomfield personally. But in retrospect what I would have liked to ask him is whether he published it in Prague because it was not the kind of work hard-headed linguists did in United States. If you look at the ideas, you will see that his schizophrenia was rather deep. In his major book, *Language* (Bloomfield 1933), the major text of modern American linguistics, he is very critical of the concept of hidden structures, ordered rules, and that sort of thing: "this is old fashionable mentalism, we want get rid of this crazy ideological baggage". On the other hand, if you look at his grammar of Menomini, his generative grammar in the Paninian tradition, it is full of hidden structures and ordered rules. That is exactly what he is rejecting as nonsensical in his theoretical work, published exactly at the same time.

Even more striking was that no one pointed out to me, a young undergraduate doing some work, that just a few years earlier, the leading figure in American Linguistics had done something very similar, on another language. I found out about it almost twenty years later, when I had become interested in History of Linguistics. That is part of the third topic I mentioned, the difference between what actually happened and what should have happened. That is the Paninian source of Generative Grammar, it's very significant and now understood (cf., e.g., Kiparsky 1979), though it was unfortunately without influence at the time.

<sup>4</sup> The student was HOCKETT, C. (b. 1916). The paper is "Implications of Bloomfield's Algonquian Studies". *Language* 24: 117-131 (1948). Bloomfield's "Menomini Morphonemics" is not cited. Hockett noted the omission when he reprinted this article in a Leonard Bloomfield anthology published by Indiana University Press (Bloomington 1970:495).

Another major source, 17th-century linguistics and its later developments, what I called 'Cartesian Linguistics', but in the special sense that I mentioned, led to a tradition of what was called the 'Universal Grammar', 'Rational and Philosophical Grammar' sometimes. Its basic conception was that there is a "notion of structure" in the mind of the person. You and I have some kind of notion of structure in our mind and we would like to know what the nature of that notion of structure is and what its origin is, how did it get there and what is it. This notion of structure allows us to create "free expressions". We can say new things, different from anything in our history or even the history of the language. These new expressions are not determined, they are not caused, they are not determined mechanically, in the manner of machines. They are not determined by our inner state and our external environment. They are doubtless influenced by our inner state and external environment, but not forced by it. We somehow choose within that range, but we typically choose in a way which is not caused by situations, but which is appropriate to situations. These properties of being uncaused but appropriate, unbounded, but not random, evoking comparable thoughts in other people — these are the properties of free expressions. For Descartes that is a fundamental difference between man and machine, between man and animal. That goes right on to Rousseau and to Romanticism for a long period, in ways that have not been well understood. One reason, say, in the case of Descartes and Rousseau, may be that Rousseau is considered the leading figure of Romanticism, and Romanticism is considered to be an attack on Rationalism. Therefore, they are studied from different points of view. And it's correct, they are different. But then you miss the fact that some of the crucial ideas on which Rousseau based his libertarian social theories involve a man-machine distinction in terms that go straight back to Descartes.

Anyway, Rational and Philosophical Grammar was concerned with these ideas: the notion of structure in the mind, its origin, its nature, the way it is used to construct free expressions. The inquiry was concerned both with what was called Universal Grammar, what is common to all languages, and Particular Grammar, specific properties of one or another language.

Actually, what I have been quoting is from the last representative of this tradition. Otto Jespersen (1860–1943), a famous Danish linguist, in the early part of this century. The tradition lived from the 17th till the 18th century, then it declined, and, by the early 20th century, virtually disappeared. Jespersen was perhaps the last major figure. The book from which I am

quoting is from 1924 æ which happens to be the year of the founding of Linguistic Society of America, which went in a totally different direction, Structuralist and Anthropological Linguistics. Leonard Bloomfield, the leading figure, was aware of all this, he in fact reviews Jespersen (Bloomfield 1922) and commends him, but all this knowledge disappeared. Even Edward Sapir (1884–1939), who was the other major figure of modern American linguistics, even his work basically disappeared. It was also work that involved underlying mental structures, ordered rules, abstract sound patterns and so on, but by the time I was a student, in the late 1940s, this was already ignored and dismissed, although everyone who had studied with Sapir — he was very much admired — had read what he wrote.

Jespersen, I discovered on my own, as a student. Browsing in a library, I have just come across his books, which looked intriguing, and so I picked them up and read them. I don't think I ever mentioned it to anyone. It seemed so far out of contact with anything that was happening that I just took it as an exotic personal interest. Jespersen's own extensive linguistic work came back into Generative Grammar, at MIT, thanks to a visit by a Israeli scholar who happened to be a specialist on Semitic and Hamitic languages.<sup>5</sup> He had Classical Education, from Europe. He knew Jespersen's work and told us about it. We got interested, and people started to study Jespersen detailed grammatical works. This is how the way things did happen, not the way they should have happened.

By the time that Morris Halle and I wrote *Sound Patterns of English*, in 1966 or so, it was by then consciously modeled on Panini and on Sapir and, since the early 1960s, we have been doing work on the developments from the early Cartesian ideas on language, what I called 'Cartesian Linguistics', including the forms that they took in British Empiricism, in the Romantic period, Wilhelm von Humboldt (1767–1835) and others. Some of this work is reviewed in *Cartesian Linguistics*. So by then, the integration of the field was conscious, but that was after most of the work have already been done. The origins were discovered after they have been rediscovered, which is not the way things should have happened. It should have happened quite differently.

In particular, one idea that was central to the tradition from the 17th century was the collection of properties of free expressions that I mentioned

<sup>5</sup>The Israeli scholar was Hans (Hayyim) Jacob Polotsky (1905–1991).



earlier. That played a very crucial role in Cartesian thought and developments from it, well into Romanticism. The phrase that was used for that idea by Wilhelm von Humboldt, in the early 19th century, was that language involves “infinite uses of finite means”. And that’s true. You have finite means because your brain is finite, but you use it infinitely, in a creative fashion. And that was a kind of paradox. How could that it be possible? One of the reasons why this work died off is that there was no way of expressing that concept, of making clear what it meant. Well, by the mid-20th century part of the problem had been resolved. In the formal sciences, Mathematics and Theory of Computation, certain aspects of the idea of infinite use of finite means have been very much clarified. In fact, by the time that I was a student, this was second nature and that turned out to be exactly the idea that was needed to return to traditional concerns of Generative Grammar and Universal Grammar, and approach them in a much more constructive way. You could now make explicit the vague and obscure notions that had been perceived in the earlier period, but in a way that you couldn’t do much with. There was a lot of good talk and suggestive comments, but only limited constructive achievement.

We can turn now to what should have been — the ideal history. In this history, the Generative Grammar of the 1940s and 1950s should have been a kind of coming together, a confluence of traditional insights, which were vague and obscure, with a conceptual apparatus that had been developed in the formal sciences, and that now allowed these traditional ideas to be captured and studied, at least partially. That’s the way the subject should have developed, along with the recognition of the Paninian roots in Classical India, which dealt with a part of the topic, in a very precise fashion, not reaching to the infinite use of finite means. The ignorance of the past in the case of linguistics is remarkable, but it was part of something much more general æ again I’ll turn back to personal history.

As graduate student at Harvard University, I was actually mostly studying philosophy, with leading figures in the field, Willard V. O. Quine (b. 1908), and others. Cambridge, Massachusetts, where I was, was one of the main centers of contemporary philosophy. They had the best students, now teaching all over the world. We didn’t read very much, we were never expected to read anything in the tradition. We read the things that our professors were responding to. We read the later Rudolf Carnap (1891–1970), because Quine was criticizing him, and we were familiar with Logical Positivism, because it was then under critical discussion by the philosophers

read at the time. We were familiar with the later Ludwig Wittgenstein (1889–1951), his work were just about appearing, and with the philosophers of Oxford, in England, which was a major center. People went up and back between Cambridge, Massachusetts, Cambridge, England, Oxford, there was a lot of interchange. All of that ongoing work was familiar. One read early Bertrand Russell (1872–1970) æ not late Russell, incidentally, early Russell æ Gottlob Frege (1848–1925), modern logic and its roots and not much else. We knew that there was somebody named Hume, and Locke, and the Presocratics, that sort of thing. But it was not something that was well known or understood and, incidentally, it's still not studied in much depth even in many of the better programs. The ignorance of the past was not restricted to linguistics. It was also true for philosophy in general and, in fact, it reflects something quite general about the cultural environment I mentioned before. Whatever are the reasons for the intellectual isolation æ that's another interesting topic, I can say something about it later, if you like æ it's a fact and a problem that is only very partially resolved today.

Just to illustrate how sharp the isolation was æ with again a personal story æ in the early 1960s, must have been 1962 or 63, a very well known classical philosopher from Princeton, Gregory Vlastos, came to Boston to give a talk. His talk was on Plato's dialogue *Meno*, the famous dialogue in which Plato describes how a slave boy knows Geometry, even without any experience. He demonstrates this by just asking the slave boy a series of questions, giving him no information and drawing out of the uneducated slave boy knowledge of geometry, which means that it was always there, hidden there somewhere. Julius Moravcsik, I, and some other friends, went to the talk and there was a strange confrontation. Vlastos gave a scholarly account of the dialogue, but presented it as if it was something absurd and ridiculous, sort of apologizing for bothering to talk to us about this sort of thing. We were then young, right out of graduate school. We took the opposite view. We raised questions and we said 'no, it's very serious', and, in fact, it's correct, that's the way things really work. Plato was essentially accurate. Vlastos was surprised, he actually believed that as well, but he knew that in the cultural environment of the times, one didn't say things like that. After all, this is an era of hard science, behavior is someone can talk about, not strange mystical ideas. He was surprised to see young people from the center of academic life taking it seriously and saying that that was the way things worked. Later we went out and had a beer together, talked about it and became quite friendly. But he was amazed to find that young people were actually interested in this and agreed with him, his secret views that this was

indeed correct and, in fact, it is (cf. Vlastos 1973).

That's part of the basis of the Cognitive Revolution, which reconstructed these ideas in many ways. We now don't talk about reminiscences from an earlier life, which was Plato's explanation. Rather in terms of genetic endowment. But if you want to be honest, that's about as mysterious as Plato's reminiscences. At this stage it sounds scientific, but nobody has any idea of what it is. So it is the contemporary counterpart of Plato's reminiscence, with a hope that one will somehow find the basis in biochemistry. Again that illustrates the isolation that was prevalent at the time. That brings us to the so-called Cognitive Revolution of the 1950s, of which Generative Grammar was a part. It contributed to it, it drew from it. People do call it the Cognitive Revolution æ I have never called it that æ I personally don't, because I think it was not a revolution. It was a rediscovery, and, in fact, it seems to me, if you look at it properly, it was maybe a second Cognitive Revolution, in many ways quite similar to what was happening during the first Scientific Revolution of the 17th century, which so radically changed the view of the world. Descartes and others studied very much the same topics that came into the center of attention in the 1950s, primarily, vision and language, those were two main themes of study then as now, in ways which were not unlike the way they began to be studied in the second Cognitive Revolution of the 1950s.

This change æ whether we call it a revolution or not æ did shift perspective. At the time the topic of study was things you could more or less see. So, Structuralism studied patterns that you could observe; it was phenomenalist, for some, like Jakobson, consciously phenomenalist. You were supposed to perceive the features and you see their structures, so it's sort of like studying the form of a snowflake. You see its structure, you look at the parts, but not at the principles that determine these curious forms. Structuralism is like that. The other major tendency was behaviorist. You look at behavior, actions which you can observe. The general field of social studies, History and Political Sciences, Language and Anthropology, these were called the Behavioral Sciences, because they studied behavior. So, you studied behavior, or you studied patterns and structures. Linguistics investigated a *corpus* of actual texts that you analyze into parts and their arrangements, keeping to something observable. That was supposed to be very hard-headed and scientific, which is very curious, because the sciences don't do anything like this, and, in fact, haven't since maybe Babylonian Astronomy. What the sciences study are inner mechanisms, hidden structures,

which account for some of the observed phenomena. But the observed phenomena in themselves have no interest. The reason why people do experiments æ there are plenty of observable phenomena in the world, one could go on forever describing them æ is because the observable phenomena are mostly useless, they don't tell you anything. If you want to know specific answers to particular theoretical questions, that means you have to invent the phenomena you are going to try to explain. For several thousand years the sciences had not been pursuing the path that was considered to be scientific and was taken as the model by Behavioral Sciences and by Structuralism æ which is again a curious anomaly.

The Cognitive Revolution shifted perspective from the study of behavior and structures and patterns and text to the study of the inner mechanisms of mind that account for these phenomena, and much else, mechanisms that are mostly hidden. So, it's the topic of inquiry that shifted. What was the topic before is now just data, maybe good data, maybe bad data, but just like things you notice as you are walking around the room, not a topic. From this point of view, Behavioral Sciences are a very strange field. It's as if you called physics 'meter-reading science', because in physics people read meters. But physics isn't meter-reading science. You read meters because they tell you about something. Physics is the study of what they're telling you about. Behavioral science was just the study of the 'meters', and Structuralism was the study of the form of snowflakes, but not the principles that make things snowflakes.

That was an important shift and, with that shift, it became possible to revive traditional ideas that go back to Universal Grammar and the 17th century. Saussurean Structuralism certainly was important, but mainly outside of linguistics. It had its importance in anthropology, history and literature, but in linguistics it had very little long-term impact, except for the study of sound systems. Here there was progress, because there were patterns of some interest. But if you look at Saussurean Linguistics, it didn't even have a place for the concept of sentence. The concept of Sentence has a sort of uneasy existence between *langue* and *parole*. It doesn't really fit in either. But you can't have a study of language that doesn't have the concept of sentence, at least, or of phrase. And it's not there. It's excluded from the very narrow, rigid and indeed rather superficial approach to language that was taken in Saussurean Structuralism, which has disappeared almost without impact in the study of language, apart from sound systems, where there were interesting discoveries about patterns, and a few other areas. I don't

want to exaggerate.

The second Cognitive Revolution rediscovered independently, in ignorance, many ideas and insights of the Scientific Revolution of the 17th and 18th century, as I mentioned, primarily in vision and language. The study of vision in fact reconstructed a lot of Cartesian ideas, about computational systems of vision, about using the inner resources of the mind to construct patterns and exemplars in terms of which experience is interpreted. These ideas later entered modern philosophy, mostly through Kant, but they are actually Cartesian ideas, very well developed in 17th-century Neoplatonism, from which Kant may have taken them, (Arthur Oncker) Lovejoy (1873-1962) suggested, and then gave them a different form. That was independently rediscovered in the 20th-century theory of vision, in ways I will not have time to go into. In the study of language, the ideas about free expressions, about the creative aspect of language, again became central. In the 17th century, Cartesian philosophers æ the most important in these domains was probably Géraud de Cordemoy (1626–1684) æ developed tests to determine whether another creature has a mind. We have a theory of the world that says that there is mind and body, and we want to know, we want to have a test to decide if something has a mind. It's just as if you were a chemist and you have acids and bases, and you want to know whether something is one or the other. So you put a piece of litmus paper in it, and if it turns red it's an acid, and if it turns blue it's a base. So, you want a litmus test for body and mind, and Cordemoy and other Cartesians proposed tests to see if another creature has a mind, typically language tests. They investigated the creative aspect of language use. And their conclusion was, reasonably, that, if the creature passes the hardest tests you can invent, to test whether it has the strange properties of language use, then it would only be reasonable to assume that it has a mind like ours. That's standard science, perfectly ordinary science, like chemistry. It's the way to decide whether some substance has a particular property.

There was also good reason to assume that the world was divided into body and mind. The reason was what was called at the time the 'mechanical philosophy'. Remember that 'philosophy' at the time meant "science", so, it's mechanical science. Mechanical science was the idea that the world was a big machine, big, complicated machine, like a clock, but much more intricate, which could, in principle, be put together by a master craftsman. In fact, it was put together by a super master craftsman, according to the ideas of the day. But, in principle, you can build it. From Galileo through

Descartes and Christiaan Huygens (1629–1693), and other 17th-century scientists æ basically, from Galileo to Newton, that was the conception of the world. That's the origins of modern science: the world is a machine. But it was pretty obvious that these properties of mind like the creative aspect of language use could not be realized in a machine. That's correct, it can't. Therefore, the Cartesians postulated another principle beyond machines, the properties of mind. That's all reasonable science. It turned out to be wrong, but almost all science turns out to be wrong, so that's not too surprising. But it was perfectly reasonable science, and, in that context, they wanted a test, a litmus test. There is a certain similarity to what is these days called the Turing Test for machine intelligence, named after Alan Mathison Turing (1912–1954), famous British mathematician, and one of the founders of computer science, among other things. The Turing Test is supposed to be a way in which you can try to see if a machine is exhibiting intelligent behavior. However, there is a significant difference between the Turing Test and the 17th-century tests. The 17th century tests were perfectly reasonable science, the Turing Test is something quite different. Furthermore, Turing was aware of it. Turing was a smart man. He wrote a very important paper in 1950, which is the basis for modern artificial intelligence, chess-playing machines, this sort of thing (Turing 1950). Much of the discussion about whether machines have intelligence would be avoided if people read Turing's paper, instead of just looking at the test that he constructed. Turing pointed out that the question whether machines think "too meaningless to deserve discussion". So, he is not asking whether machines think, because it is a meaningless question. That's like asking whether submarines swim. If you want to call it 'swimming', okay, it's swimming, if you don't want to call it 'swimming', it's not swimming, but it's not a factual question. It's like the question whether the space shuttle flies. If you want to use the word 'fly' for that, okay, if you don't, okay. Turing regarded it as a meaningless question, and he is quite right, it's a completely meaningless question. The reason is that the word "think" is used for people, just as the word "swim" is used for fish, not submarines. There is no question today whether machines think, but unfortunately there is a lot of discussion of this non-question and, in fact, it is a major topic in contemporary Philosophy and Cognitive Science. But it makes no sense at all, as Turing recognized. In contrast, the 17th century discussions make perfect sense, because, then, it was a scientific question. They assumed that there were two substances, there was body and mind, and it made perfect sense to see whether something had one property or the other. So, in this case, there hasn't been rediscovery, there has actually been regression. We are below the level of understanding that had been

attained in the 17th century, although, as I say, Turing was clear about it.

Going back to the 17th century, the reason why this stopped being a question was Newton's great discovery that the Mechanical Philosophy is false. The world is not a machine. Newton didn't show that there was anything wrong with mind. That stayed. What he showed is that there are no machines in the world. The world is governed by what he called an occult property, a mystical property, namely 'attraction at a distance'. Newton regarded this as a completely absurdity, as did his contemporaries, but unfortunately it was true. The world is just based on a mystical force. You can't build a world because it's based on a mystical property, namely 'attraction at a distance'. A few years later, by about 1700, people were discovering other mystical forces like electrical attraction and repulsion, also totally mystical, not things like machines. After that, science just goes on in its own way, constructing one mystical concept after another, abandoning any hope of human understanding, in the sense that had been sought, because that's all gone. We don't have an intuitive understanding of science since Newton. We just sort of work out the things that seem to explain the world however absurd they sound.

At that point, there is no body left, no machines left. You can't postulate a second substance on the grounds that mind is not body, because nothing is body. So the mind/body problem disappeared and the Cartesian tests disappeared, because there's no body. There's nothing physical, in the old sense; there is just the world in all its aspects, including its mental aspects, its electrical aspects, its chemical aspects and so on. Since that time, the Cartesian tests for other minds don't make any sense but the ideas were correct: the creative aspect of language use appears to be a fact, one of the strange properties of the world, like attraction at a distance, or electrical repulsion or even stranger properties that have been discovered since.

Right around that time, just before Newton, before this terrible, shocking discovery was made  $\alpha$  and it was a great shock  $\alpha$  the Port-Royal Grammar came along. The Port-Royal Grammar and the Logic, around 1660, partially under Cartesian influence, partially under the influence of Renaissance grammar (as is pointed out in *Cartesian Linguistics*, incidentally.) Under these influences, interesting ideas were developed, including: the concept of sense and reference, which is fundamental to modern logic and mathematics, rediscovered by Frege. The theory of relations is developed in a kind of rudimentary form. On the language side, it's the first real exposition

of what later came to be called Phrase Structure Grammar and Transformational Rules. They were there, in some fashion, and in an interesting fashion.

The Port-Royal Grammar (Arnauld & Lancelot 1660), I should say, it is often seriously misunderstood, even in contemporary scholarly work, as is the whole tradition of the Universal Grammar and Rational and Philosophical Grammar. A common assumption is that they were trying to seek a kind of perfect language, rational language, not like these bad things that people speak. But that's simply untrue, that's a misunderstanding of what "philosophical" and "rational" meant. "Philosophical" then meant what we would mean by "scientific". Rational meant in part what we would mean, though we might say "formalized" or "explicit". Rational grammar doesn't just say this happens, that happens, but tries to make it precise and give reasons. Universal Grammar is precise, scientific grammar. It was not concerned with perfect languages, but with the vernacular, the spoken languages. That is very explicit.

This work was incidentally written in French, which is, for the time, important because not long before one wrote in Latin, but now in French, as did Descartes. It's a big break, just like doing experiments was a big break. When Descartes would go to a butcher shop, buy a sheep and start cutting apart its eyes, that was considered very improper. Gentlemen didn't do things like that. They were readers of ancient texts or something like that. But this engagement with the world, whether it's cutting the eyes of sheep, or looking at spoken French, that was something new.

One of the main topics in the Port-Royal Grammar was something that was called the 'rule of Vaugelas'. I won't go to the details, but, in 1647, Claude Favre de Vaugelas (1585–1650) wrote a descriptive grammar of French. This was one of the first descriptive grammars of a spoken language. It was a plain descriptive grammar, not pretentious. He didn't try to explain much, but he did find some very interesting things about spoken French, which were serious puzzles: questions about when could you use relative clause, when you couldn't use a relative clause, with interesting examples. He gave a descriptive rule, which is known as the rule of Vaugelas. That was a major theme of Universal Grammar for about 150 years. People tried to figure out, to give an explanation for the rule of Vaugelas. The Port-Royal Grammar explains it in terms of the notions of sense and reference, in the Fregean sense. So it's an explanatory grammar, trying to describe and explain



phenomena of the spoken language, that's what Universal Grammar really is.

Vaugelas was not the first to construct a descriptive grammar of an actual spoken language. The first one, as far as I'm aware, I'm relying here on Carlos Otero, (Otero 1995) was by Leon Battista Alberti (1404–1472), “a brilliant grammatical sketch” of Florentine. A better known example is the first Spanish Grammar, published in Spain in the “fateful year” of 1492. The Spanish author was Antonio de Lebrixa (1444?–1522) also known as Nebrija. Vaugelas' was the first descriptive grammar of French, in 1647. The Port-Royal grammar (Arnauld & Lancelot 1660), a couple of years later, tries to explain it, in more or less modern terms, and so things go. 1647 is a kind of interesting year. 1647 could be regarded as the origin of Modern Linguistics, the year of the first extensive descriptive grammar of a vernacular language, opening interesting puzzles, which have to be explained by principles. It's modern linguistics. The following year, 1648, is sometimes taken as the year of the beginning of modern chemistry. Brock's (1992) standard history of chemistry opens with an “arresting experiment and conclusion” by a chemist named Johann(es) Baptista van Helmont (1579–1644), published in 1648. Van Helmont found a very surprising, and a very convincing result, which “capture[s] the essence of the problem of chemical change”, Brock observes. He demonstrated experimentally that pure water could turn into a tree, with nothing added, which is very mysterious. Water was regarded as the pure substance at the time. It had no components, it was just an elementary, indivisible substance, and the experiment seemed to show that it could turn into something of great complexity: a tree. Chemistry then developed as the study of how complex structures come from simple things, just as linguistics did. The parallel is quite striking.

The conclusion drawn from van Helmont's experiment is, of course, false, but it was very convincing. And in fact it remained convincing for a long time. It wasn't really explained until Antoine Laurent de Lavoisier (1740–1796), about 150 years later, in 1789, who finally demonstrated that water isn't a simple substance; other things were going on. But the real discoveries about photosynthesis and so on were not made until more recently. At the time, van Helmont's was a very convincing experiment, with the wrong result. It was consistent with the belief on the part of Newton and others that the world consists of tiny little hard particles they called ‘corpuscles’, which could be arranged in different ways. Just as bricks can be used to build different buildings, the same corpuscles can form water or

build a tree, and you can take it apart and build something else. That's why Newton was interested in Alchemy, transmutation of one thing into another. Nowadays this is described as sort of crazy, but it was perfectly reasonable. It's perfectly reasonable science, clear, shown to be wrong like almost everything.

The origins of modern chemistry and the origins of modern linguistics are somewhat parallel, with a similar character. Chemistry is the study of how complex forms are constructed out of simple parts, and there's something similar in language. You study how complex structures are made out of simple components, like phonological features, elementary semantic features or Aristotelian causes, and so on. Chemistry, from that point on, developed on its own. It was not connected with Physics. It couldn't be, because Physics was incapable of incorporating chemistry until the 1930s. It was only very recently that chemistry and physics were unified, after the quantum revolution in physics. Meanwhile, linguistics and logic took off on their own. They became the study of the mind, unrelated to the natural sciences, even to the brain sciences, although now there are beginning to be the kinds of linkages which maybe will lead to unification, as they did in chemistry quite recently.

If we had a real history of the topic, these are some of the things we would be discussing, in my opinion. We would be discussing the Paninian origins, the great Scientific Revolution, the forms that it took in the study of complex objects like languages and molecules and chemical substances, the ways similar ideas developed into the Romantic period, both in Universal Grammar, and the theory of how experiences are constructed by the mind, and in social and political philosophy, as developed by Rousseau and later by Humboldt and classical liberalism, with many further offshoots. All of these topics come from more or less the same network of ideas. It was all forgotten, partially picked up again, in the mid-20th century, in what it's called the 'Cognitive Revolution'. There's a lot to learn here, I think. These are all fascinating questions, with a lot of contemporary implications, quite apart from their intellectual interest. There is a great deal to do to try to discover and understand their various fragments, to ask why they have flourished, why they faded, and why there were such surprising gaps when you would have expected continuity and revision rather than rediscovery without awareness. History follows very strange paths. Much too little is known about it, and it is barely understood.

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