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A Grammatical Paradigm

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Kuhn asserts the philosophy that science incurs ‘paradigm shifts’ which are the shifts from normal science to one of a radically different competitor. In the study of linguistics, Noam Chomsky’s concepts of universal and generative grammar show an equivalent shift in that way of thought. Illustrated bellow is the comparison between Kuhn’s transition of paradigms and Chomsky’s linguistic pursuits and its consequent effects on the field. The following issues in linguistics are discussed: how a person learns and develops a language, how a person structures and understands a sentence, and what the purpose of linguistics is as a whole. Chomsky’s universal and generative grammar come together to answer these questions, in which previously established paradigms did not answer. By doing so, these ideas come to redefine the purpose of the study. Overall, the approach to understand language, and the entirety of the linguistic field, underwent a transformation that drastically changed not only linguistics, but science in its entirety.

Avram Noam Chomsky was born in 1928, in Philadelphia. Chomsky is known for his work at the Massachusetts Institute of Technology, for his political pursuits, and most importantly, for his theories in the discipline of linguistics. It was during his time at the University of Pennsylvania in which he decided to pursue this study. His interest in the subject was spurred by his professor, and mentor in early studies, Zelling Harris. “His friendship with Harris was growing and it took on what could now be described as mythic proportions. Chomsky seemed to have been elected to follow up on, and expand, Harris’s work, and Harris became for Chomsky, a figure with whom, and ultimately against whom, he could measure his own

achievement" (Barsky 52). The young linguist was interested in what linguistics could reveal about society, and Harris was interested in the potential his student had. Much of Chomsky's early research started in the hopes to prove Harris's theories correct. It was only later in his research did he find issues and thus developed his own linguistic concepts. These concepts not only revolutionized the idea of the origin and process of understanding language, but it changed the linguistic paradigm. His ideas changed how the entire study defined its discipline, and changed the structure in which it works.

Before one can argue Kuhn and Chomsky's paradigm relationship, there must be a set definition of a paradigm in which it is developed. Kuhn states: "A paradigm is rarely an object for replication. Instead, like an accepted judicial decision in the common law, it is an object for further articulation and specification under new or more stringent conditions" (The Structure of Scientific Revolutions 23). A paradigm is a universal scientific achievement accepted by practitioners, only for a time, that pose facts and questions. They create the standard for the accepted way of scientific thought. Paradigms gain their status due to the fact that they are more successful than competitors in solving the few problems that other scientists believe are extremely important and crucial. However, this does not make them foundationally factual, rather the most viable amongst the alternatives in a particular historical situation (The Structure of Scientific Revolutions 146). Once a paradigm is set, normal science is pursued in order to expand the scope of the paradigm's reach, and then to elaborate it with further scientific research.

Pre-Chomsky linguistics approached issues with a behaviorist view when it concerned the acquisition of a language. "During the first half of the 20th century, linguists … held that language learning, like any other kind of learning, could be explained by a succession of trials,

errors, and rewards for success" (University). Linguists believed that children learned language through imitation, by listening to and repeating what adults said. After hearing the spoken conversations around them, children could create associations for those words and string them together in a sentence. It was only this acquisition of experience that a child could depend upon to learn a language. Behaviorists viewed language as an absorption of the language around a person, which accounted for learning different languages in different regions of the world. However, linguists believed that not only did infants learn language through society, but that the meaning of words, and the structure of sentences, attached themselves to the society around them.

Although it was agreed that language had a general grammatical structure, society played a key role in the minds of structuralist linguists. Structuralists treated language "as a purely social phenomenon, like tool making or table manners" (Fox). The rules of grammar were learned by the source of the previously acquired language. Grammar was determined by the society and was not independent in its meaning. This implied that there were multiple types of grammatical rules depending on geographic locations, social trends, etc. Rather than having a universal set of rules, the grammatical laws were constantly adapting. This set of rules then developed sentences that were accepted by their face value. Language, in the mind of these linguists, had no further philosophical implications and was not treated as a consequence of a physical science. Linguists studied language without considering its relationship to the brain, or psychological means. To structuralists, language was merely the reflection of society. In fact, to others, considering anything but these assumptions was absurd due to the fact that linguistics was considered a finished field.

While most fields continue to push towards advancement, the field of linguistics, before Chomsky, considered itself to be completed. Chomsky commented that "in the late 1940s … most structural linguists had concluded that the field was essentially finished." (Barsky 50). The revolutionary science in the linguistics field, before Chomsky, was over and the point of their study was to classify. To most linguists the subject of their field was the corpus of utterances and its goal was the classification of the elements of the corpus. "American linguists regarded the aim of their discipline as being the classification of the elements of human languages. Linguistics was to be a sort of verbal botany" (Searle). Within the old paradigm there was no room for advancement and change. The field of linguistics, as well as the approach taken concerning its material, took a dramatic turn once Chomsky's research was published and publicized. Like most classes of science, Chomsky found that there was much work to be done within the field, and sought to further the scope.

Within a paradigm of science, research takes place in order to further articulate the given paradigm. This research is considered to be 'normal science'. Normal science is the extension of knowledge concerning the facts of a paradigm by increasing the scope of its research. Normal science, Kuhn defines, is a 'mopping-up operation' in which scientists fix the issues of the paradigm. In its very nature, normal science lends itself to paradigm shifts. "Normal science does and must continually strive to bring theory and fact into closer agreement, and that activity can easily be seen as testing or as a search for confirmation or falsification" (The Structure of Scientific Revolutions 80). Through research, normal science aims to resolve issues found in the previous paradigm and further the scope of the current paradigm. According to Kuhn, there are three types of scientific investigation within this normal science. The three types of research include: the attempts to increase the accuracy and scope of facts within a field, the comparing of

theories directly to nature, and the determination of physical constants. These forms of research aim at classification of the previous paradigm, in the hopes to further its scope. However, normal science is eventually halted with the awareness of anomaly, the recognition that nature has somehow violated the expectations that exist within the paradigm. Once confronted with the crisis the anomaly creates the nature of scientific research changes accordingly. From then on scientific research focuses on dealing with the anomaly, rather than the extension of the scope of a paradigm.

Corresponding with their mentor-mentee relationship, after meeting Harris, Chomsky's research in linguistics aimed to prove his teachings. "His attempts to make Harris's methods work constituted Chomsky's early linguistic research" (Barsky 52). Due to his research Chomsky published his first article in *The Journal of Symbolic Logic.* Although he continued to make these theories work throughout most of his college career, his ideas and theories of linguistics soon diverged from his mentor. While pursuing his graduate degree, Chomsky encountered many questions with nonexistent answers. Even at a young age, his ideas proved innovative and different from the rest. By the end of his college career Chomsky had adopted a "completely non-procedural, holistic (in that the evaluation measure proposed was a measure applied to the whole system), and realist approach" (Barsky 53). Through his pursuit of normal science Chomsky encountered linguistic anomalies in which there was no way, in the old paradigm, to move forward. Instead of pursuing the old paradigm, he reevaluated his view of the entire field.

Normal science deals with the presence of anomalies in two ways: the paradigm is adjusted or the paradigm is discarded, thus spurring the creation of a new paradigm. "Confronted with anomaly or with crisis scientists take a different attitude toward existing paradigms and the

nature of their research changes accordingly" (The Structure of Scientific Revolutions 91). Research, rather than being an accumulation, changes to a reconstruction of the field. The 'mopping up operation' that normal science creates ends when a new paradigm is adjusted so that the anomalous becomes the expected. Once a paradigm is adjusted, it is only a matter of time before further scientific research reveals another anomaly (the defined area of research a paradigm creates ensures that anomalies will occur). This cycle of adjustment continues until the paradigm is unable to accommodate the anomaly. This inability to reform creates a crisis in the scientific community due to the need for a structure in which they research. Rather than adjustment, the discovery of an anomaly induces the need for a change in paradigm, creating the start of a paradigm shift. Kuhn states that it is these crises that "account for what is probably the most brilliant and consuming work of the eighteenth century" (The Structure of Scientific Revolutions 32). Different scientists within the field then strive to resolve the anomaly, creating a battle amongst ideas within the discipline. With the creation of a new school of thought, the scientific community is left at an impasse, eventually waiting for one school to win over the other.

Chomsky questioned the old linguistic paradigm when he came across the anomalies that concerned the approach to understanding the procurement of language. Chomsky initially questioned the belief that the acquisition of language was due to the development of an inventory of responses to stimuli. This, to Chomsky, seemed unlikely due to the fact that he realized that every sentence that someone produces can be a completely new combination of words. "When we speak, we combine a finite number of elements – the words of our language – to create an infinite number of larger structures – sentences" (University). Even when a person considers a finite range of terms, the sentence can always grow and become longer. Children can produce

and interpret a multitude of variously ordered sentences that they have not encountered in the learning process. Chomsky believed that learning a language was an advanced skill that only certain species of animals could truly obtain. It was this ability to use this advanced skill, although understanding only parts, which pushed Chomsky to resolve this, and further, anomalies in the approach to grammar and its overall understanding.

The old paradigm also had anomalies when it concerned the structure and understanding of basic grammar. Chomsky refers to the famous case of "John is eager to please" and "John is easy to please" (Searle). Though at surface value both sentences are formed the same, they both have drastically different grammatical meanings. Both are constructed using the same phrase structure: noun-copula-adjective-infinitive verb (Searle). However, the former uses John as the subject of the verb in which he is eager to please someone. The latter uses John in relationship to the verb by stating that he is easy to please. Basics structuralist ideas that were prevalent in previous paradigms had no explanation for this drastic difference. These structuralist ideas also had no explanation for sentence ambiguity. Chomsky found that certain sentences were ambiguous due to the syntax. One example of this is "I like her cooking" (Searle). The perspective from which a person views this sentence, or which words he or she emphasizes, determines what the sentence means. For example, the sentence could mean that the person in question enjoys the food she cooks or it could mean the person enjoys her physically being cooked. How, then, does linguistics explain these circumstances? In addition, does this ambiguity mask a deeper definition or overarching meaning? Due to the fact that structuralist methods could not explain these anomalies, Chomsky began to challenge not only the approach, but the meaning of the study of linguistics as a whole.

Research under an anomalous paradigm builds until there is an acceptance of a new school of thought. Scientists cannot discard one paradigm without replacing it with another, which is why paradigm shifts are few and far between, because it requires a great deal of commitment and trust. “The man who embraces a new paradigm at an early stage must often do so in defiance of the evidence provided by problem – solving. … A decision of that kind can only be made on by faith.” (Copernican Revolution 158). These radical concepts that induce change tend to be more natural and simpler than the old. Although they often attract only a few scientists, it is upon these few that its ultimate triumph may depend. “To reject one paradigm without simultaneously substituting another is to reject science itself. The act reflects not on the paradigm but on the man. Inevitably he will be seen by his colleagues as ‘the carpenter who blames his tools’.” (The Structure of Scientific Revolutions 79). These scientists further establish this new school of thought until it can no longer be argued, and it creates a radical overturn and is accepted as the new paradigm.

Chomsky believed that the acquisition of language was not determined by a finite amount of experience, but rather an innate knowledge. Chomsky believed that in order to understand how one learns a language, they must first “describe a "universal grammar," a model of the shared properties that apply to all languages. “There are two possibilities. One, it’s a miracle. Or two, you have some internal system of rules that determines the structures and the interpretations. I don’t think it’s a miracle” (Discover Interview: The Radical Linguist). He believed it was these universal principles that allowed children to learn a language they are exposed to. Chomsky believed that man is “a syntactical animal producing and understanding sentences by virtue of possessing an innate system of grammar, triggered in various possible forms by the different human languages to which he has been exposed” (Searle). Despite

language barriers, Chomsky believed that all human languages have similar structures including phrase structure rules and transformation rules. The heart of Chomsky's argument lies in the fact that he believes that language is an extraordinary intellectual achievement, too advanced for an organism that is not innately designed to achieve it. There was no other reason why, for Chomsky, a normal child whose knowledge on the topic is based upon a small dose of experience can then "effortlessly make use of an intricate structure of specific rules and guiding principles to convey his thoughts and feelings to others, arousing in them novel ideas and subtle perceptions and judgments" (Studies on Semantics in Generative Grammar 4). By applying Chomsky's universal grammar theory to the anomalous incidents, the anomalous becomes the expected.

By applying Chomsky's universal grammar to the previous anomalies, one can find resolution. Considering the acquisition of language in the previous behaviorist context, there is no logical explanation on how a child understands a language in different forms than how he or she is taught. However, by applying universal grammar, one can see that part of the acquisition process is, in part, an innate knowledge humans are born with. Due to the fact that this logically makes sense, the only way to recount it is for the "anti-Chomskyan to propose a simpler grammar that would account for the child's ability to learn a language and for linguistic competence in general" (Searle). This simpler account has yet to be done. In addition, it seems unlikely that this simpler account will be created, due to the support his theory has gained since its creation. The lack of a rebuttal created a wave of support behind the linguist, who then furthered his research in the other realms of linguistics. Chomsky then tried to prove, not only how we learn a language, but how we structure and understand it as well.

Chomsky determined that in order to understand language a set of rules would have to account for the anomalies previously discussed. “Language is a process of free creation; its laws and principles are fixed, but the manner in which the principles of generation are used is free and infinitely varied” (Language and Freedom 211). Within linguistics would be a set of laws within grammar that could create sentences would not create anything that was not a sentence, and that would describe the structure of a sentence. These rules are what Chomsky referred to as generative grammar. “Hence, a generative grammar must be a system of rules that can iterate to generate an indefinitely large number of structures. This system of rules can be analyzed into the three major components of a generative grammar: the syntactic, phonological, and semantic components” (Aspects of the Theory of Syntax 15). The syntactic component would generate the structures of what constituted as a sentence. There would be many of these structures considering the infinite amount of sentences that could be produced. The phonological component referred to the relationship between the meaning and the sound of a sentence or word. Lastly, the semantic component is the meaning of a sentence that is thereby determined by its deep structure. These rules would, for example, explain why “we recognize that a sentence such as “Colorless green ideas sleep furiously.” is grammatically correct English, even though it is nonsense.” (University). By applying this concept to the anomalous, Chomsky found the anomalous now had become the explained, or expected.

Generative grammar addresses the anomalous previously stated by creating multiple layers of sentence interpretation. Beneath the basic level of interpretation is the deep level, which is broken into two parts. The first part is the semantic component. For example, a sentence can be broken down to formulas that consist of ‘noun phrases’, ‘verb phrases’, ‘adjectives’, etc. In addition, sentences can also be broken down into surface and phonological layers. This layer is

referred to as the ‘transformational component’. For example, one can interpret what a sentence literally means on the surface, and it can also interpret a deeper unconscious meaning. Addressing the previously stated anomalies, one can recognize that “I like her cooking” and “John is eager to please” are sentences. Thus, one would apply the previously stated generative grammar rules to explain the anomaly in order to make it the expected. While “I like her cooking” has one surface meaning, it has multiple deep meanings. “John is eager to please” may be syntactically different than “John is easy to please” but both have similar phrase meanings. Most anomalous sentences can be understood when applying these layers of syntactical, phonological and semantical understanding.

With Chomsky’s redefinition of the goal of the field, he thus redefined the subject of the field itself. He recognized the fact that there would always be an infinite amount of sentences that could be created in any language. Thus, he decided, linguistics was not the study of some sentences that people inherit from others, due to the fact that people could not inherit an infinite amount of phrases. Thus, linguistics was actually the study of the meaning of sentences and how people come to know and create an infinite amount of them. “The proper object of study was the speaker's underlying knowledge of the language, his ‘linguistic competence’ that enables him to produce and understand sentences he has never heard before” (Searle). The subject of linguistics changed to one that focused on the speakers’ universal linguistic competence, which in part, was what he referred to as universal grammar. The goal of the field was then to further specification of grammatical rules underlying the structure of sentences, or what he referred to as generative grammar. This new approach to the study of linguistics, gave the science a new structure, a new paradigm, to work forward in. Since then, linguistics has continued with this mindset and continues to develop it further every day.

Chomsky's work in linguistics was not only a paradigm changer, but also is an example of revolutionary science. Kuhn's concept around revolutionary science is built upon this concept of a paradigm. However, within the paradigm change, a larger revolution of thought occurs. Revolutionary science states that: "all the forms of mental activity, the most difficult to induce is the art of handling the same data as before, placing them in a new system of relations with one another by giving them a different framework" (The Structure of Scientific Revolutions 1). Characteristics of revolutionary science according to Kuhn include the following: they are holistic in the sense that they cannot be made one step at a time and they contrast with normal change, they include a meaning change in the way words and phrases attach to nature and they involve a central change of a model, metaphor or analogy. While paradigm changing science can usually be coined as 'revolutionary', these characteristics can particularly be placed on Chomsky's linguistic pursuits.

Chomsky's paradigm changing works are an example of revolutionary science. Chomsky's research is an example of revolutionary science in the basic sense that it induced a paradigm change. That being said, his linguistic pursuits also reflect the many characteristics that revolutionary science holds. "[Chomsky's] discoveries were … comparable with the physical sciences in the seventeenth century, when the great scientific revolution took place." (Language and Problems of Knowledge 91 - 91). First, his concepts were holistic in the sense that they were accepted all at once. His pursuits in linguistics did not aim to further the paradigm, but rather make the anomalous the expected. This pursuit then spurred a paradigm shift. Once the paradigm was shifted, there was no way to go back to the initial concept. Second, it involved a meaning change when concerned the terms 'grammar' and 'linguistics'. Grammar suddenly had multiple facets, and linguistics was no longer the study of previous paradigms. Lastly, there was a central

change of model from a behaviorist/structuralist view of linguistics, to one that focused on universal and generative grammar. Overall, Chomsky's pursuits in the field of linguistics are a type of revolutionary science by a revolutionary scientist.

In Kuhn's works he defines what qualities are needed to be a 'paradigm changing scientist'. In order to determine whether or not Chomsky has the ability to meet these standards, we must apply these qualities to his discipline. Kuhn describes the paradigm changing scientist as "a solver of puzzles, not a test of paradigms." (The Structure of Scientific Revolutions 144). Their attention is concentrated on the important crisis – provoking problems. In addition the scientists are either young or so new to their field that they are not committed to the world view or rules that had been determined by previous paradigms. "He is like the chess player who, with a problem stated and the board physically or mentally before him, tries out various alternative moves in the search for a solution." (The Structure of Scientific Revolutions 144). Revolutionary scientists, in addition, are the few whose research convinces the small amount of needed scientists to push the school of thought forward and expand its scope. It is through this additional research that the school of thought gains its popularity, makes drastic change, and becomes revolutionary.

As previously stated, Noam Chomsky pursued linguistics when attending the University of Pennsylvania. Even while attending college, Chomsky's beliefs diverted from the norm. At the young age of 29, Chomsky published his work *Syntactic Structures* in which he first addresses these concepts of grammar and linguistics. He clearly is an example of a young scientist, who aimed to solve anomalies. Rather than continuing in his pursuit to prove his mentor correctly, Chomsky had pursued resolution in the issues he found. Lastly, "Chomsky did not convince the established leaders of the field but he did something more important, he

convinced their graduate students. Chomsky attracted some fiery disciples, notably Robert Lees and Paul Postal." (Searle). It is through these, as well as other, passionate scientists that his concepts were developed and gained popularity. After convincing few at a young age, he started on a road of development that continued on until he redefined the approach to linguistics and the study as a whole.

After the paradigm shift in the field of linguistics, there has been a decisive shift in the problems available for analysis, and the very standards in which a discipline determines what are acceptable issues and solutions. Considering this fact in the simplest sense, Chomsky's paradigm changing concepts opened the field of linguistics for more interpretation. Linguistics transformed from a field that was considered closed and had a small community, to one that is continuing to expand in subject and in followers. The discipline now measures anomalies and issues in the field in its relation to deeper meanings within language and the relationship to the human mind. "In the traditional study of grammar, you're concentrating on the organization of sounds and word formation and maybe a few observations about syntax. In the generative linguistics of the last 50 years, you're asking, for each language, what is the system of rules and principles that determines an infinite array of structured expressions? Then you assign specific interpretations to them" (Discover Interview: The Radical Linguist). Previously, language was considered an absorption of knowledge, but now linguistics is tangled with psychology when it concerns innate concepts and deeper meanings within words and phrases. "Chomsky's theory of language and mind has been influential on scholars in many different fields— cognitive psychology, philosophy, some branches of mathematics" (Stark). Chomsky's research has altered the scientific imagination in the sense that it has opened up a field of science for more discovery.

Language has become something to interpret and understand rather than something that is practical.

Concerning Kuhn's philosophy of science, Kuhn believes that science incurs 'paradigm shifts' which are the shifts from normal science to one of a radically different competitor. Noam Chomsky's concepts of universal and generative grammar show an equivalent shift in that way of thought. Chomsky argues that a person learns a language partially due to a universal grammar, in which a person has an innate concept of language. He also states that there is a generative grammar that is a set of laws that dictate what can be considered a sentence, and explain certain anomalous questions that past paradigms had not answered. Lastly, it is due to these revolutions, that Chomsky realizes that the study of linguistics is the study of the meaning of languages and how people come to have a linguistic competence instilled within them. Throughout Chomsky's revolutionary research, he redefines the approach to understand language, and the entirety of the linguistic field. Chomsky's revolutionary transformation drastically changed not only linguistics, but science overall.

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