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A Study of Metaphor in Science

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Abstract: For a long time, metaphor has been universally viewed as a rhetorical device and as an ornament to enhance linguistic effectiveness. The language in science is always featured as professional, strict, accurate and plain. Therefore, some people contend that it should not keep any contact with metaphor. However, with the study of cognition developing, piles of researches and facts and data show us that metaphors are omnipresent in human's life and science. In this paper, the author tries to give a thorough study of metaphor in science by analyzing the motivations of metaphor rising in science (the question of "why"), the possible accesses of metaphor formation in science (the question of "how"), and the great functions of metaphor in science (the question of "what") with the aim to strengthen the understanding of metaphor in science.

Key words: metaphor in science, motivation, access, function

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The study of metaphor has a long history both in China and the West. In China, metaphor is mainly studies as one kind of rhetorical means. While in the West, metaphorical study has experienced several reforms. modern scholars view metaphors not only as a rhetorical means but also as a cognitive means. I. A. Richards (1936) claimed that "Metaphor isthe omnipresent principle of language", and that " nearly 70% of our language are metaphors."

However, maybe owning to the specialty of science language and the influence of traditional concepts about metaphor, people usually have a false impression that there is no metaphor in the scientific language used to reflect the process and the fruits of human cognition. In fact, few works are contributed to metaphor in science. Therefore, it is of great value to look into the subject in a tentative way.

1 What is metaphor?

"What is metaphor?" Actually, there are various metaphor definitions, but we cannot determine which one is the last or best one. Because with more study carried out, with more features about metaphor discovered and identified, a new and more accurate definition will replace the former one. Every "old" definition acts as the stimulation of the "new" one's appearance, which composes "stepping-stones" in the theoretical history of metaphor development.

As early as 300 BC, Aristotle defines metaphor in his Poetics: "Metaphor consists in giving the thing a name that belongs to something else; the transference being either from genus to species, or from species to genus, or from species to species, or on grounds of analogy." This classical rhetorical approach to metaphor dominated the western thought for over two thousand years till 20th Cen-

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tury.

Richards(1936) suggests "Metaphor is not just a verbal matter, a shifting and displacement of words; rather, it is the by-product of human thought process, which is itself metaphorical in nature." This definition of metaphor lays a foundation to the theory of Interactivism of metaphor.

Lakoff and Johnson(1980) put forward :"Metaphor means a cross-domain mapping in the conceptual systems." Their study begin the cognitive study of metaphor.

It is worthwhile to introduce three basic terminologies concerning metaphor.

Image(vehicle): the picture conjured up by the metaphor, which may be universal(glassy stare), cultural (green thumb), or individual(a papery cheek)

Object(tenor): what is described or qualified by the metaphor.

Sense (ground): the literal meaning of the metaphor; the resemblance or the semantic area overlapping object and image.

2 Metaphor in science

Before the study of cognition, we had to admit that the study of metaphor in science was neglected by scholars. By grace of modern cognitive study, people come to reconsider the role of metaphor in science. Metaphor in science, to put it in a simple way, is the application of metaphor in scientific and technological language and writings. Metaphorization in science is such a crucial means to know the world that sometimes it is a necessity, not a choice for our people to survive in the world.

2.1 Motivations of the rise of metaphor in science

1) Limitation of human's cognitive capacity

Our cognitive capacity is limited not only by our own sense organs but also by the new changing world. Human beings live in a physical world that is four dimensional, but human beings can only perceive it in three dimensions. What we can perceive is already not the reality itself, but a projection of our experience of reality in time and space. Thus our experience is limited just as James (1930) says " … the universe of all of us is still to a great extent such a confusion, potentially resolvable and demanding to be resolved, but not yet actually resolved." In addition, the world is changing with each passing day. People need to undergo a continuous process of modification with the development of the world. It is unlikely that we can always keep the same pace with the new changing world in time forever. Plato once declares that we human beings will never be able to see the true world.

2) Scientific development and language poverty

Along with the lasting advancing of human world, increasing number of scientific products, technology and concepts are flooding into our life. Some of them are fantastic; some of them sound absurd. The things seem impossible yesterday are being used today—such as the airplane, the Internet, the discovery of DNA, the transplanting of human's hearts which sounded absolutely impossible before the 20th century by scientists then—all of these fully prove that our cognition of microcosm is always indefinite. Even the contemporary science with invincible might and varied contents is still not enough for the explanation of the profound mysteries of the existence. In contrast, human language is relatively definite and keeps stable. We can find that less and less professional and distant scientific terms appear in science language, instead, increasing popular and daily words are used in scientific works—those words' borrowing mainly are the results of metaphorization. If, if that is a big if, that every new discovery needs to create its corresponding name or term, how many words should be remembered? According to related statistics, annual scientific discoveries increased by thousands. In that case, what a big burden it is to our human beings!

3) Scientificness of metaphor in science language

Hegel holds the point that people have to express "mental" phenomena with the aid of "perceptual" ones, thus giving birth to metaphors. Some people argue against that Science and technology are concise, strict and professional. Metaphor applying in EST will be labeled as vague, fancy and not serious. But who can tell the so-called knowledge reveal the absolute truth? Scientists' research itself is a social activity of people as individuals, and so-called knowledge and truth are relative. For example, is a molecule of water (H_2O), one of our necessities, really made up of only two atoms of hydrogen and one atom of oxygen? If so, how to explain the minerals existing in the purified water which purified water plants

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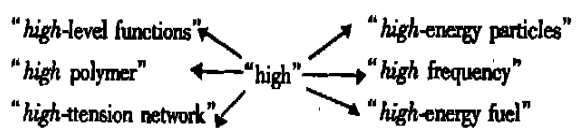
always boast of? On the country, the relative vagueness of metaphors can leave much room for further scientific exploration in the future without losing present value and meaning. So in this sense, metaphor application is a scientific way of viewing our world. In a word, its merits outweigh its demerits.

2.2 Possible accesses (Metaphor is a rational bridge)

Petrie once said that metaphor is a rational bridge that the statement itself is a prime metaphor. The bridge comes across between people's daily life and scientific field within which interact each other all the time.

1) Analogy from daily-life concepts to scientific concepts

Studies of cognitive psychology shows that the process of human beings cognition develops from concrete to abstract, from simple to complex, from unknown to known step by step. Because scientific concepts are usually hard to grasp, most time scientists turn to applying common daily-life concepts to name or explain them. In computer science there are many terminologies borrowed from common words, most of which are vivid metaphors. Such as: "electronic brain", "menu", "memory", "storage", "window", "data warehouse", "internet", "electronic mail", and so forth. Here is another example, the metaphorization of "high" in the spatial domain into the scientific domain engenders many terms.



In the "umbrella"-shape-like illustration, the concept "high", a spatial word, is applied to so many different sciences with the help of metaphorization.

2) Analogy within scientific concepts

Metaphors within scientific concepts are grounded on the similarity between multi-disciplines. Owing to some commonness, they can borrow the expressions from each other. The most obvious examples are follows: in the 1950's, the government of the United States fully developed domestic highways which impelled the vigorous development of economy. Therefore in the 1990's Clinton government put forward the metaphorical concept of "information highways" in the congress when arguing about adding financial allocations to develop the internet with the opposition factions in which experts combine the computer term with the road-building term. Promptly many metaphorical expressions emerged in newspapers and magazines such as:

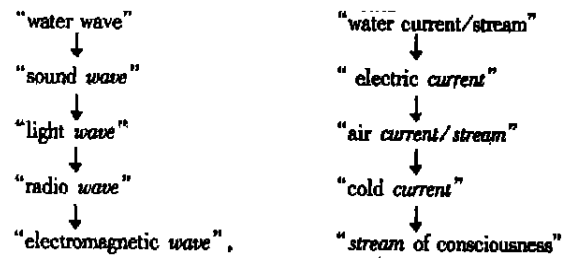
(1) Prime Minister rides the info-highway

(2) White House counts two million cypertourists

(3) Clearing the roadblocks on Japan's information highway

(4) It is still a bumpy highway for data.

Sometimes "metaphor chains" are formed within different scientific conceptions. Two examples:



All these conceptions' constructions are built on one same image, and metaphor acts a linking strip through them.

2.3 Main functions of metaphor in science

Metaphor applied in science brings us so many great functions that a great many philosophers and scientists use metaphorical expressions consciously or unconsciously when they engage themselves in abstract thinking and arguing about their own view.

1) Creating new meanings

Basically metaphors are divided into similarity-presenting metaphor and similarity-creating metaphor. In most cases, metaphors do creation as well as presentation in subjects mapping. Similarity-creating metaphors take up a major portion of the metaphors we usually encounter. Obviously, they are cognitively more valuable than metaphors that are based on preexisting similarities.

Metaphor is created by taking one thing for another belonging to a different category. This kind of "category-mistake" is a kind of deviance from the normality. The abnormality of metaphors changes the whole cognitive order. In the transference the original classifying frame is destructed and reconstructed. It indicates the creation of a new system of a new meaning. That is to say, metaphor has the function to create new meanings. It is the same case with metaphors in science. Metaphor can activate the

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underlying meaning of a scientific term and add new semantic features through metaphorization.

A fashionable metaphor in modern era is "the computer is the human mind". Computer is kind of machine, while human is a kind of creature which can use the brain to think. They belong to different categories, but here metaphor puts them together. With this metaphor, the computer is awarded the talent to memorize, to work out data, to make mistake, and to get informed. We get to know computer more by look at human, thus something belonging to human are transferred onto computers, as we call it similarity-creation.

2) Providing new angles

The history of mankind is a cognitive process of understanding the world, objective and subjective. Analogy is one basic mode of human's cognitive ways. People tend to draw analogy between the unknown and the known, thus to understand the unknown from the known, which implies adopting new angles instead of the previous ways to understand the unknown.

When people states "idea is a building", people tries to understand "ideas" through the structure features of buildings. However, if "ideas" are metaphorized as commodities, people will interpret "ideas" from the angle of the production and circulation of commodities.

Metaphors always offer people new angles or new dimensions by which people are able to perceive the world in much wider way.

3) Stimulating scientific hypotheses

Copernicus, the discoverer of the solar system, was possessed of a vague and extravagant vision of the reality that he sought to model. Nevertheless, he put forward a bold hypothesis that the sun is the center in the universe at his time. Later this hypothesis was justified by the work of followers, such as Kepler and Galileo. Einstein admits in his autobiography that his theory of relativity is more a result of poetic imagination than that of close scientific deduction and inductions. Newton's classical physics metaphorizes the whole world as a giant machine. Aristotle (1953:31) once said "Give me a giant lever, and I can hold up the earth."

Science needs hypotheses. Metaphorical imagination is a crucial skill in discovering, reporting and communicating the scientific ideas. The development of science, in a sense, is a process of verifying the false endlessly and continuously. Without bold hypotheses, it is far from possibility to make progress in science.

Sound hypotheses are usually the mother of scientific discoveries. All the great scientists, in this sense, are great artist. An unimaginative person can collect data, but it is impossible to expect him to make any great discovery. Newton, Faraday and Darwin are all brilliant scientists who not only have rich hypotheses.

3 Conclusion

In this paper, we discussed the motivations, creation and functions of scientific metaphor. After the detail study of metaphor, we firmly believed that metaphor is everywhere in our life and our life cannot survive without it. Since the beginning of 20th Century, the relationship between the public and the science has become closer and closer, which demands objectively to popularize the scientific knowledge. Metaphor acts as a bridge to bring the science and the masses together. After all, science is discovered and created to serve the people; otherwise it will be like a palace high in the sky, beautiful but useless.

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最佳的水平速度(助跑速度利用率达到 97－98%左右)、降低三跳水平速度的损失和提高跳跃能力,应该成为我们训练的根本出发点.

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The Analysis on Speed－Rhythm Problem of Triple Jumpers at Abord

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Abstract: From the angle of kinematics, this essay has analyzed speed-rybthm problem in the triple jump. And by explaining the relation between the developing of level speed and the rhythem, and between the loss of level speed and the technique and rhythm, the author points out the important meaning and value of rhythm in the training.

Key words: triple jump; speed; rhythm

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A Study of Metaphor in Science

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摘要:长期以来,人们普遍认为隐喻是一种用来增强文彩的修辞手段;而科技语言一贯以专业、严谨,精确和朴实著称,因此隐喻不应存在于科技语言中.然而,随着认知学的发展,大量的研究和事例证明生活中存在着大量的隐喻,其中包括科技语言.本文试图从分析科技隐喻的产生动机,产生途径及巨大功能方面来较为全面地展示科技隐喻的概貌,从而加强人们对科技隐喻的认识与理解.

关　键　词:科技隐喻;动机;途径;功能

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