

TRANSFERENCE OF IDEAS ACROSS DISCIPLINES: THE CASE OF METAPHOR AND ANALOGY

Nancy E. Spears, Oklahoma State University
Richard Germain, Oklahoma State University

ABSTRACT

Metaphor and analogy are more than simple linguistic tools. This research discusses them as aids in developing ideas and theories across disciplines. We focus on a major analogy in marketing -- the biological analogy -- and briefly identify applications including product and institutional life cycle and population ecology models. The remainder of the paper is then spent tracing the intellectual genealogy of the biological analogy, documenting its use by sociologist, economists, and marketers.

INTRODUCTION

The discovery of scientific knowledge is intriguing and has received attention in the marketing literature. According to Hunt (1991), the generation of innovative scientific laws and theories proceeds along an array of paths, from dreams to variations of deduction or induction. The cogent argument has been made for the existence of a reservoir of universal scientific laws and theories; the universality of these ideas elucidates how laws and theories from one domain can find application in other knowledge fields, thereby aiding in the discovery of innovative ideas (Holton 1973). The philosophical transference of ideas between different disciplines is arguably one way of generating discoveries in a domain of knowledge, such as marketing. The purpose of the present study is to examine the transference of ideas across disciplines and the mechanisms for such transfereces.

Specifically, we examine classical linguistic mediums of the metaphor and the analogy as mechanisms for such transference; this usage of metaphor and analogy falls within the realm of Hunt's "logic of discovery" and elevates the discussion above a mundane treatment with linguistic tools. In studying how they have been applied in marketing, we focus on the intellectual genealogy of the biological analogy. Applications of the biology analogy include the life cycle (of products and retail institutions), population ecology models, and Weber's Law, to name a few. Before tracing the historical origin of the biology analogy, we first define and discuss metaphor and analogy as more than simple linguistic tools. We then focus on the biology analogy in marketing. The paper concludes with a discussion of the findings and implications for the future growth of the marketing discipline.

METAPHOR AND THE ANALOGY

METAPHOR

In examining the metaphor and the analogy as transference mechanisms, it is important to clearly delineate their distinguishing characteristics. According to the *American Heritage Dictionary*, a metaphor can be described as a figure of speech in which a phrase or term is transferred from an object that it normally designates (from the "source" domain) to one that it designates by analogy (to the "target" domain). That which is new to a people or a field of study must bear a name, and the designation of a name that is associated with a known object or phenomena to the new object or phenomena through the application of a metaphor serves a useful purpose (Kittay 1987). The metaphor has also been described as a connection between "...two domains in a way that goes beyond our ordinary category structure" (Holyoak and Thagard 1995, p.217).

Metaphors can exist as either live ones or dead ones (Tsoukas 1991). This categorization schema provides a useful lens with which to view metaphors in the present research. A dead metaphor is used so commonly that its metaphorical origin may be lost. Indeed, the dead metaphor's original departure from "standard" language usage has dimmed from the collective memory, and its position in the sign system or language of which it is a part is taken for granted (Hawkes 1980). It evokes no search for new meaning on the part of the hearer. For example, "campaign," which comes from the Latin word "campaina," originally meant "an open tract of country" and later, although still obsolete, "the period of time during which an army is in the field." One current definition is "a connected series of determined operations" (from *Webster's Third New International Dictionary*). The term "advertising campaign" is a dead metaphor since it is woven into the normal language of everyday use; its use is not intended to evoke a sense that "advertising is like a military battle." Dead metaphors add a certain linguistic richness where they are applied, but they are not the focus of our interest. Relative to the "logic of discovery," the interesting category becomes that of the live

metaphor. A live metaphor is characterized by its deviance from accepted language usage (Hawkes 1980), "guerrilla marketing" being an example. It is not a standard part of the sign system, and its marked deviation from normal usage elicits new meaning. The live metaphor stirs the listener from complacency to comprehend and assimilate the implied incongruence into a preexisting knowledge structure about the state of things. Thus, the position of the live metaphor in creating new theory and providing new insights is clear and worthy of further examination.

ANALOGY

The word "analogy" carries with it the inference that if two objects or concepts are alike on some dimensions, they must be alike on certain other dimensions as well (*American Heritage Dictionary*). An analogy drawn between two objects or concepts implies that they hold some similarities or parallel functions in common but are otherwise dissimilar. It involves observing an unfamiliar target domain (say T) in terms of an already familiar source domain (say S) and then generating a correspondence between objects in the target domain (say t) and the source domain (say s) [Holyoak and Thagard 1995]. The purpose is to reveal "deep identities" about the objects in the target domain. The result may be a scientific model applicable to elements in the target domain or a higher order model applicable to elements in both the target and source domain, the latter representing a general systems type of theory (Tsoukas 1991).

The process of developing an analogy requires illumination. A mapping is the process of making a correspondence between objects across domains. A transformation is the set of rules that guide the correspondence. Element t_1 in target domain T corresponding to s_1 in source domain S, and similarly for t up to s , are examples of transformations, the rule being the correspondence of the subscripts. Transformations can be one-to-one, one-to-many, or many-to-one. When it is one-to-one, the similarities across domains can be significant.

In mapping across domains, simplification through a many-to-one transformation often results. Tsoukas (1991) provides the following example. When an analogy is drawn between the solar system and atoms, the sun's physical properties (e.g., its size, shape, color) are lost in the transformation, but the relationships between elements across domains are retained. The planets and electrons respectively orbit the sun and nucleus and are subject to the laws of attraction. The system of relationships between the electrons and nucleus in the atomic source domain that are transferred to the planetary model are referred to as the *higher order relations*. In developing a scientific analogy, it is more desirable to retain higher order relations during transformation than to retain lower order relations or properties (such as the sun's color). Similarly, in marketing, Glazer (1991) made an analogy between organizations and computers: he equated cross-functional teams with distributive storage, parallel computing; traditional hierarchical modes of information processing with digital computing; and a firm's response time to market change with computing speed. As should be, the higher order relation between type of information processing and speed are retained within the analogy at the expense of loss of lower order properties (e.g., human rationality).

DISTINCTION BETWEEN METAPHOR AND ANALOGY

The preceding discussion suggests that a metaphor implies analogy, but not the reverse (i.e., an analogy can be metaphorical or nonmetaphorical). The greater the intellectual "distance" between the source and target domains (itself an analogy), the more likely it is that lower order properties are not retained in the transformation. Conversely, when the source and target domains are near identical, then both higher order and lower order relations are likely to be retained during transformation. The analogy between treatment for a tumor and an army general capturing a fort represents a metaphorical analogy of considerable extent. The source domain (medicine) and target domain (military knowledge) differ markedly and many lower order properties are lost. The analogy between treating a stomach tumor and a brain tumor is nonmetaphorical because the source and target domains are both medicine and higher and lower order relations are retained during the one-to-one transformation (Holyoak and Thagard 1995). In the medicine-to-medicine analogy, meaning is extended, but in the medicine-to-military case, new meaning is created.

SUMMARY

The metaphor and the analogy have long stood as useful mediums with which science has explained new phenomena (Lloyd 1966). During the 16th century, Antoine Lavoisier developed an oxygen theory of combustion (chemistry) that he subsequently applied through an analogy between respiration and combustion to animal respiration (biology). Issac Newton (1687) in *Principia*, used an analogy to his theory of gravitation (physics) to explain planetary motion (astronomy) [Holyoak and Thagard 1995]. Einstein applied a scientific metaphor by insisting that Galilean relativity in the domain of mechanics was equivalent to

Galilean relativity in the domain of electromagnetism, resulting in new scientific meaning as expressed in his Special Theory of Relativity (Gerhart and Russell 1984).

The primary distinction of importance between the metaphor and the analogy lies in the functions performed by each. A metaphor is a linguistic, visual, or intellectual resolution of perceived or actual likeness or similarity between two objects/concepts on some dimensions with an implied mapping of corresponding similarities. An analogy is the process of mapping correspondences between perceived or actual similarities in different domains of meaning or knowledge, the goal of which, in a scientific context, is to generate new theoretical insight. The marketing discipline has used the metaphor and analogy as tools to explain new phenomenon. The section that follows examines some of these applications.

THE BIOLOGICAL ANALOGY IN MARKETING

The application of biological concepts to marketing has resulted in a number of analogies. A major one is the life cycle, depicted by an s-shaped curve relating development of an entity to time. The term "life cycle" (a metaphor) is transferred from the object or concept that it normally designates (organic objects) to one that it designates by analogy. When the analogous object is the "product," the result is the well known product life cycle. Products progress through the stages of birth, youth, maturity, and death and each stage is characterized by a set of behavioral patterns linking price, product, place, and promotion (e.g., Rink and Swan 1979). When the analogous object is the "retailing institution," the result is the lesser known retail life cycle. The stages in this cycle are innovation, accelerated development, maturity, and decline, and just as with the product life cycle, each stage is associated with a prescribed set of retailer and supplier actions (e.g., Davidson, Bates, and Bass 1976; Michman and Sibley 1980).

Another major application is the population ecology model (called sociobiology by economists). In this application, entities are selected by the environment for survival. Population ecology has been applied to organizations, with selection based upon the appropriateness of the firm's marketing strategy (e.g., Achrol 1991) and to products as an add-on to increase the explanatory power of the product life cycle (e.g., Holak and Tang 1990; Tellis and Crawford 1981).

Several minor applications of the biological analogy exist, at least minor in terms of the amount of literature attention devoted to them. "Living systems" theory is a general systems explanation of organisms, ranging from single-celled organisms to nations -- with marketing situated somewhere between the two (Reidenbach and Oliva 1981). The concept of symbiosis, which may be defined as "the living together in intimate association of two dissimilar organisms for mutual benefit," has been likened to strategic partnerships in a marketing context (Varadarajan and Rajaratnam 1986, p.7). The organic type of latent, organizational design, often referred to in marketing (e.g., Slater and Narver 1995), is a metaphor originally developed by management theorists (e.g., Burns and Stalker 1961). And Weber's Law, a nineteenth century physiological theory that focuses on just noticeable differences, has been applied to marketing (Miller 1962).

A HISTORICAL PERSPECTIVE

What is certain about the biological analogy applied to social settings is that of its age. In a parable dating to ancient times, the body was said to be the Roman empire and the Patrician class its stomach. Plebeians, representing another part of the body, went on strike until they realized they could not survive without Rome's stomach (Temkin 1949). Turning aside any further efforts to identify the oldest example of biological analogy applied to social systems, we attend to the more modern work of Auguste Comte (1798-1857). He introduced the term sociology and delineated a domain for the discipline by synthesizing the works of previous social thinkers (Thompson 1975). He adopted a biological analogy by stating that families (not individuals) could be viewed as cells, social classes as tissues, and towns or cities as organs. By relating how parts relate to the whole in biology to how parts relate to the whole in sociological processes, Comte retained the higher order relations across systems (1968, 1974).

Herbert Spencer (1820-1904) brought a more complete articulation of the biological analogy to sociology. In 1851, he coined the term "survival of the fittest" to press for free market systems. In 1862, he unified all branches of science under a single "synthetic philosophy" in a general systems theory wherein he generated laws that "governed the relations among inorganic, organic, psychological, and superorganic (societal) relations" (Turner 1985, p.33). The abstractions explained the dynamics of chemical compounds, cognition, celestial bodies, social institutions, and so on. In creating these "first principles," he borrowed heavily from the physical sciences, but analogies from physics (e.g., persistence of force) were more common than from biology. Spencer also distinguished himself as the first functional analyst. This is based on the premise that societies are like organisms and that in a particular environment, parts of society (or the organism) function to preserve the existence of the society (or the organism). Spencer thus articulated on a particular dimension of his general systems theory or unifying "synthetic philosophy." He did not

discard his first principles in functional analysis; rather, he abstracted a set of principles on the biological analogy.

Sandwiched between the works of Spencer were Charles Darwin's (1809-82) most influential books: *The Origin of Species* (1859) and *The Descent of Man, And Selection in Relation to Sex* (1871). Darwin's concept of natural selection is important for our purpose. Natural selection is the concept that some species survive and others die -- it is natural in that no guiding hand exists and no reason behind the selection exists other than selection itself. Tied in with it are other familiar concepts including variation, genetic transmission of traits, the struggle for existence, and survival of the fittest. With Darwin's 1859 book, social and physical scientists recognized a more powerful biological analogy at their disposal.

The biology analogy gained adherents among economists during the late nineteenth and early twentieth centuries. In 1890, Alfred Marshall (1842-1924) wrote of "organic growth" (p.64) and of the role of biology as a framework for understanding economic behavior. Veblen (1842-1924), in his paper "Why is Economics Not an Evolutionary Science" argued that economists should but had yet to "turn to the evolutionary line of speculation" because "well-worn paths are easy to follow," and "divergence...means tentative work, which is necessarily slow and fragmentary" (1919, p.79). And in a study of business size, Chapman and Ashton (1914, p.512) commented that "the growth of business and the volume and form which it ultimately assumes are apparently determined in the same fashion as the development of an organism in the animal or vegetable world" and subsequently discussed genetic variation and dispersion of variation. The growth pattern represents a business life cycle wherein decay and loss of vigor ultimately envelope the institution after maturity.

Yet, at much the same time, a mechanical or Newtonian orientation was propagated as the standard orthodoxy of neoclassic economics. Léon Walras (1834-1910), who introduced general equilibrium theory, said that "this pure theory of economics is a science which resembles physio-mathematical sciences in every respect" (1954, p.71). Other noted economists of the period including William S. Jevons (1835-82) and Vilfredo Pareto (1834-1923) made similar statements on the mechanical nature of economics (Hodgson 1995).

French sociologist Gabriel Tarde (1843-1904) also adopted an anti-biological analogy in his landmark *The Laws of Imitation* (1903: a translation of reorganized material originally appearing between 1882 and 1888). Tarde proposed, and was perhaps the first to do so, three developmental stages in the acceptance of ideas, goods, and social desires: "a slow advance in the beginning, followed by rapid and uniformly accelerated progress, followed again by progress that continues to slacken until it finally stops" (p.127), stages that are clearly analogous to those proposed by post-1950 advocates of the product life cycle. Tarde said it was best to leave "the biological considerations...to more competent hands" (p.xxii) thereby discarding an evolutionary basis with one founded upon the social foundations of imitation and innovation. Tarde noted that his stages were driven by: (1) the progress or decline of some sort of imitation; (2) an invention which eventually is imitated; and (3) the imposition by the environment or society of factors that modify the spread of imitation.

One of the more persuasive rejections of the biological analogy was offered by James Baldwin (1861-1934). He represented a growing sentiment, well established by the turn of the century, that Spencer's functional analysis was outmoded and examined the appropriateness of biology as a source domain for generating insights into the social sciences (1902, 1909). Among others, Baldwin claimed that the "social matter" of biology is living organisms; but the social matter in the social sciences includes mental and moral characteristics that comprise "social fitness." The "social situation" is different in sociology as compared to biology. In sociology the organization of individuals and their ability to cooperate as a group or to confront other organized groups predicts survival. In sociology, "social transmission and progress" or "social inheritance" of social matter, minus genetic transmission, critically determines social variation in a manner unmatched in biology. And the nature of "rivalry" is different across biology and sociology. In biology, physical, organic fitness is the prime qualification for selection. In the social arena, selection is based on social and moral fitness. As an example of the latter, Baldwin notes that an organized social unit (such as a business) forecasts demand, provides supply, anticipates economic and industrial movements, and weighs customs (1902, p.41-60). Baldwin's objections to the application of the biological analogy to social situations is summarized by the following: "to say that the brain corresponds to the 'executive' function of government is as grotesque, if used for more than an illustrative figure of speech, as it is to say that the priests are the social 'parasites' and the police the social 'phagocytes'" (1909, p.40).¹ Baldwin's position is an

¹ A phagocyte (currently spelled phagocyte) is any cell that characteristically engulfs foreign material...and functions in the body to remove and consume debris and foreign bodies: source: *Webster's Third New International Dictionary* (1966), Chicago: William Benton Publisher, 1962.

attack on the mapping process from biology to sociology. In that mapping process, the lower order properties of the elements in the social set are sufficiently degraded to render the higher order relations among elements in the social domain generated from the biology domain meaningless.

But the biological analogy possessed enduring appeal. Prescott (1922) recognized that the curve depicting population growth across time was similar to the curve depicting the sales of some products. He then set out to provide the first mathematical application of the s-shaped curve to product sales. The mapping of the biology-based population growth curve to a business application was a sufficient contribution that recent writers, such as Buzzell (1966), label Prescott a leader in developing the product life cycle. Increasingly, since the late nineteenth century and culminating during the inter-war period, the environment in which theorists on the biological analogy were operating harbored adherents to "Social Darwinism" and eugenics. To some extent, we can speculate that theorists like Tarde and Baldwin were affected by such movements when formulating rejections to the biological analogy. And other theorists did not adopt the biological analogy to the fullest extent possible. Prescott (1922) never said that products were like organisms and never used any term remotely close to "life cycle." Rather he more simply said that the curve depicting sales was similar to a biological growth curve and that the mathematical model applied to biological growth could be applied to product sales.

It was not until the 1950s that the biological analogy again began to receive literature attention. Three economists mark the decade. The first is Joel Dean (1950, 1951) who apparently introduced the term "product life cycle" (1950, p.53). The cycle consisted of two main phases: (1) a pioneering phase when products are new; and (2) a maturity phase. Dean's work may be summarized as follows: "throughout the cycle, continual changes occur in promotional and price elasticity and in costs of production and distribution. These changes call for changes in price policy" (1950, p.45). Arguably, a close reading of Dean's work reveals he never fully articulated a biological analogy. He used terms like "life cycle" and "speed of degeneration" and he concentrated on rational decision making in the face of innovation, imitation, shifting elasticities and costs, ease of competitive entry, and so on -- that is, an economic approach. He never said anything remotely like "products are like biological organisms." From a marketing perspective, Dean's contribution was one of integration: he brought together into a single framework the idea that products progress through stages and the stage of a product in its cycle has important implications for promotion, price, and distribution.

Amen Alchian (1950) laid forth the concept that natural selection occurs in industry with some organizations selected for survival and others for extirpation. He advocated that such may exist even without the participant's being aware of their costs or demand (i.e., profit maximization or rational behavior may not be occurring). Alchian's work laid the foundation for more detailed work by sociologists on natural selection by the environment of organizations (e.g., Hannan and Freedman 1977). And it is this later work that influenced marketers when devising their own population ecology models of strategy and of products.

The third important author of the decade was Edith Penrose (1952). Her paper was in the mold of Baldwin, except that she focused exclusively on attacking biological analogies in economics. In particular, she advocated the uselessness of: (1) organic growth theories, or those proscribing a life cycle analogy of birth-maturity-death to organizations; (2) natural selection by the environment of organizations; and (3) homeostasis, or the theory that disturbances of specific desired states of equilibrium result in motion (or action) to retain the desired state. The latter was expounded by Boulding (1950) in his example about the desired state of a corporate balance sheet and by Noyes (1948) to explain consumer wants.

During the 1960s, the term "product life cycle" crept into the marketing vernacular and it, along with the typical sales curve somewhat later, began appearing in marketing principles textbooks. By the late 1970s, the product life cycle had undergone a tremendous amount of scrutiny, culminating with a special issue of the *Journal of Marketing* devoted to the concept (Day 1980). Much of that scrutiny focused on missing variables, such as competitive pricing, firm size, and firm age (e.g., Wind and Claycamp 1976). In essence, the transformation rule from biology to marketing was attacked as important lower order properties of products were not accounted for in the mapping process. Another set of criticisms focused on higher order relations. In biology, stage lengths are deterministic and hence biologists have little difficulty in predicting movement from one stage to another. In marketing, stage length varies from product to product and predicting a shift from stage to stage is quite impossible. In biology, stage ordering is immutable (death follows life). In marketing, product extensions may result in a new growth phase. Even the causal ordering of sales and behavior is questioned in marketing: i.e., does sales affect strategy or the reverse? (Chakravarthy 1984; Dhalla and Yuspeh 1976; Lambkin and Day 1989). These criticisms, while wounding the product life cycle as an analogy, have not slain it.

Rather, additional transformation rules have been introduced to form population ecology or evolutionary product life cycle concepts (e.g., Holak and Tang 1990; Tellis and Crawford 1981).

One last note deserves mention. A significant component of economics has been described as emanating from a mechanical analogy (e.g., neoclassical economics), thus providing a competitive backdrop to the biological analogy. The mechanical versus biological analogies vie against one another for recruits into the field and ultimately for intellectual legitimacy. In marketing, any such competition between analogies is quite benign. The only theory reliant upon a mechanical analogy is the Law of Retail Gravitation (Reilly 1931). In his book, Reilly never actually drew a mechanical analogy -- that is, all references to gravity were limited to the law's title. It was up to later authors to make the analogy. For example Reynolds (1953, p.273) said that the concept, along with its variants, "are derived from 'Newton's Law of Universal Gravitation' where business volume is substituted for force and population for mass, distance remaining unchanged." During the 1930s, Reilly's Law was viewed as overly simplistic and since the 1950s has not received mainstream favor by marketing academicians. Thus, in marketing, unlike in economics, there is no competition between divergent analogies seeking to explain the same phenomenon.

CONCLUSION

Marketing academicians have expressed concern over the borrowing of ideas from other fields of knowledge. In reflecting upon the history of the *Journal of Marketing*, Day (1996) noted that the predominant theme of the previous decade centered on integration. This approach added much to the discipline in terms of understanding and predicting phenomenon unique to marketing, but resulted in the marketing discipline becoming "a heavy net borrower in the exchange of concepts and theories" (p.14). Consumer behaviorists expressed a similar lament: "the focus [in consumer behavior] has been on the testing of borrowed theory from the social sciences" (Chakravarti 1992, p.353).

The notion of a reservoir of universal scientific laws and theories suggests that these laws and theories can find utility in more than one field of knowledge. Holton (1973) expressed this concept very eloquently: "If we drew all the links between fields on the intellectual map, we would see instead of separate strings of beads a tapestry, a fabric of ideas...science is then seen to be in dynamic interaction with the total intellectual activity of an age" (p.478). Hence, the borrowing of ideas from other disciplines exists as a natural consequence of the "total intellectual activity of an age." The utility of such ideas across domains of knowledge should not be the focus of intellectual deliberation as much as the manner in which these ideas are transferred. Our research delineated the metaphor and the analogy as implements for the transference of ideas from one field to another.

If one accepts the argument that scientific knowledge is useful only in the domain in which it is developed, then it is reasonable to conclude that each field should produce its own laws and theories and refrain from any borrowing from other knowledge areas. However, the examples we provided illustrate the movement of scientific ideas across chemistry, biology, physics, and astronomy through the mediums of the metaphor and analogy. Indeed, history itself testifies that the transference of sound, practical laws and theories across knowledge boundaries is not new and has long been recognized as an acceptable approach to explaining phenomena and generating discoveries within a field. The present study further demonstrated that marketing has likewise made use of metaphors and analogies, resulting in the successful transference of intellectual ideas from biology, sociology, physics, and physiology. Thus, the marketing discipline has followed in a long tradition of drawing from a universal reservoir of knowledge. In the process, it has furthered the understanding of the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services through the integration of useful theories and laws found in the "tapestry" of the "intellectual activity" of the age.

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