Saussurean Sign Theory in the Human Sciences Today

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Abstract
As is well known, modern semiotic theory is based on two models of the sign—the Saussurean and the Peircean. While the latter has been shown to be much more tenable as a theory of semiosis, the Saussurean model cannot be totally ignored, not only because it was an initial attempt to define signs in a social-conventional way, but was also a basis upon which signification has been extended today in the human sciences. This paper looks at the latter aspect of Saussurean theory.

Keywords: sign theory, human sciences, structure, binarism, opposition theory

1. Introduction

As the founder of both contemporary linguistics and semiotics as autonomous sciences with his *Cours de linguistique générale* (1916), Ferdinand de Saussure has left his footprints not only in both of these disciplines, but also into various other disciplinary domains, from anthropology to computer science. Although semiotics has been highly shaped since at least the 1960s by Peircean theory (Peirce, 1931-1958), Saussure is being reconsidered and revisited in the light of relevant work in the various cognitive sciences today (for example, Sanders, 2004; Bouissac, 2010; Joseph, 2012; Thibault, 2013; Daylight, 2017). As is well known, Saussure employed the term *semiology,* rather than *semiotics* to describe the scientific study of signs and sign systems. The latter term, adopted by the International Association of Semiotic Study in 1969, comes out of the tradition associated primarily with Peirce, reaching back to the ancient physician Hippocrates and to English philosopher John Locke (1690) in the seventeenth century.

Despite the shift towards Peircean theory, there are at least three key notions in Saussure—*structure, opposition (différence), markedness*—that have remained (or have become) central to semiotics, linguistics, psychology, and various other sciences and disciplines, including anthropology and the study of mathematical cognition. The aim of this paper is to revisit these three ideas, discussing their utilization or diffusion in some of these disciplines selectively, arguing that Saussure has found a veritable niche in the overall approach to the human mind today, even though this may not be recognized by the very scientists who have adopted ideas that are either similar or identical to his.

2. Structure

The concept of structure is, needless to say, an ancient one, and found throughout philosophy and mathematics. In semiotics, it implies the relations between the parts or elements of forms that reveal a repeated pattern. As Sebeok and Danesi (2000) have argued, the semiotic (semiological) concept of *structure* has a different meaning than the philosophical notion of *form.* A trivial example will suffice, which nonetheless encapsulates the difference between the two. The triangle in geometry has a specific *structure* consisting of three sides that meet to form three vertices. However, the actual *forms* that this structure takes will vary (isosceles, scalene, right-angled, etc.).

This duality applies across semiotic systems, and is often labeled an *emic*-vs.-*etic* opposition—deriving initially from the *phonemic*-vs.-*phonetic* opposition—or the *type*-vs.-*token* difference. The *emic* dimension refers to an abstract category or subsystem, while the *etic* one implies a physical manifestation of the category. So, the triangle itself is an emic category (no matter how it is shaped), differentiated from other geometrical categories (such as squares, parallelograms, etc.). The various triangular shapes—isosceles, acute, obtuse, etc.—are the various etic forms that the category takes. Similarly, in the domain of phonology, the phoneme /p/ in English has two phonetic variants (allophones)—an aspirated [p^h] used in word-initial position followed by a vowel (*pin, pot, pen, pal, put*) and a non-aspirated [p] found in all other word environments (*place, pry, spin, spot, spill*). The emic-etic distinction is not just an interesting or trivial description of a geometric or pronunciation phenomenon; it has psychological validity, as indicated by the fact that even children recognize the different forms of triangles as belonging to the same category and native speakers of English similarly recognize that the /p/ sounds are variants of the same emic category. This fundamental difference in structure was put forward by Kenneth Pike in his important 1954 book *Language in Relation to a Unified Theory of the Structure of Human Behavior*, although it clearly has its roots in Saussure, as we shall see.

The identification and constitution of any structural category involves two main psychological features in tandem—differentiation and combination. For example, in music, the arrangement of tones into sequences known as melodies is felt to be "musically correct" only if this arrangement is consistent with harmonic structure. So, in order to recognize something as a melody, we must: (1) be able to differentiate it from other melodies; and (2) know how its component parts fit together. More technically, Saussure called the former *paradigmatic* (differential) and the latter *syntagmatic* (combinatory) structure. These form co-occurrent modalities (difference and combination) in how we understand signs (words, numerals, etc.) and how we decode them. All sign systems possess these structural relations at various levels. For example, what allows us to detect a difference in the meaning of, say, *pat* and *cat*, are the minimal phonic differences between initial /p/ and /k/. This is a paradigmatic feature. Analogously, in music, a major and minor chord of the same key are perceivable as distinct on account of a half tone difference in the middle note of the chord. Similarly, the left and right shoes of a pair of shoes are identifiable in terms of the orientation of the shoe. Now, we note that the forms *pat* and *cat* above are not only differentiable relative to each other, but they are also recognizable as English words because their constituent sounds have been combined in ways that are consistent with English word structure. On the other hand, *tpat* and *tcat* would not be recognized as legitimate words in English because they would violate such structure. In other words,

the forms *pat* and *cat* are meaningful because they also have *syntagmatic* structure. In music, a melody is recognizable as such only if the notes follow each other in a certain way (e.g. according to the rules of harmonic progression); two shoes are considered to form a pair if they are of the same size, style, and color; and so on.

Saussure (1916, p. 31) introduced the notion of *code* to explain how we glean meaning from such relations—defined simply as the assignment of meaning to sign structures. He distinguished *code* from *langue* (the abstract knowledge of a sign system), which is made up of various codes. So, if a verbal text is written in Swahili, the speaker-hearer must know Swahili grammar, lexicon, semantics, etc. (*langue*) in order to extract any meaning from it (the *code*). Consider how we interpret decimal numerals. The distinguishing aspect of the relevant code is that the value of any digit depends on the position it occupies in the numeral. This is a paradigmatic feature, which assigns value to it. The digit 3, for example, has different values in the numbers 73 and 37, because it occurs in different positions in each. The numerical value in this system is determined by multiplying it by a successive power of ten (starting from the right side). This is a syntagmatic property in the decimal code. Now, for a place-value numeral code to work, a sign showing that a certain place can be left empty (without value) will be required. That symbol is, of course, 0. For example, to represent the value "ten", 0 is used in the "ones" place and 1 in the "tens" place. The result is 10. The 0 sign has had significant implications for semiotic theory, which need not concern us here (see, for example, Rotman, 1993).

The notion of *value ("valeur")* is fundamental in Saussurean (1916, pp. 251-258) semiotics. Essentially this means that any sign or sign form in a system of signs is perceived as meaning-bearing through perceivable differences (*différences*) built into some aspect of its constitution—a minimal difference in sound, a minimal difference in tone, a minimal difference in orientation, and so on. Minimal differences such as these produce *value*. The meaning we then assign to them is what Saussure called their *substance*. Rather than carrying intrinsic meaning, Saussure argued, signs had *value* in differential relation to other signs or sign elements. To determine the *value* of an American quarter, for instance, one must know that the coin can be exchanged for a certain quantity (a *substance)* of something different and that its value can be compared with another value in the same system, for example, with two dimes and one nickel (Malmberg, 1976). Counting with fingers, or with substitutive signs such as pebbles and knots, is an instinctive semiotic act that involves *value,* suggesting that it may be an innate trait of human perception. In effect, people across the world recognize something as a number—as having paradigmatic numerical *value*—through its differential properties with other numerical signs. The constituent digits in decimal numerals take on specific values not only in terms of their actual physical shapes, but also in terms of the positions they occupy in the numeral. Thus, we read the values of 7 and 3 not only in terms of their differential forms (7 has a different shape than 3), but also in terms of their position in a numeral: 73 = 70 + 3; 37 = 30 + 7.

Ever since Saussure elaborated its features in the study of linguistic signs, the notion of structure has become central to linguistics, semiotics, psychology, and anthropology. The theory of the phoneme, of distinctive features, of the perception of form within Gestalt psychology, among many other areas are all either derived directly from Saussurean structuralism or else have unwittingly adopted it on their own terms. The term *structuralism* is, in fact, sometimes used as a synonym for those disciplines that have a Saussurean heritage (acknowledged or not). For

the sake of historical accuracy, it should be mentioned that structuralism affected the work and ideas of the early founders of psychology (Wundt, 1880; Titchener, 1910), who attempted to provide a scientific basis to the perception of forms and the structural categories to which they belonged. As Roman Jakobson understood early on in his career (e.g., 1939, 1942) the Saussurean notions were critical in gaining an understanding of how we perceive, understand, and develop sign structure (Andrews, 1990). He found, for instance, that children acquired phonemic structure to refer to objects and events in their immediate environment by first distinguishing between general phonic categories (consonants vs. vowels) and then by further discriminating among the significant differences within each category—known in developmental psychology as progressive phonemic differentiation (Jakobson, 1942). The reason for this is to be found in the neurophysiology of the brain. Phonemic distinctions are perceived by the hearing center of the brain and produced through its motor pathways via a complex neural coordination system of twelve cranial nerves. Seven of these link the brain with the vocal organs. Some perform a motor function, controlling the movement of muscles; while others perform a sensory function, sending signals to the brain. The larynx controls the flow of air to and from the lungs, and the ability to control the vocal folds within it makes it possible to build up pressure within the lungs and to emit air not only for expiration purposes, but also for the production of sound. In order for phonemic discrimination to emerge, this neurophysiological system must develop first or in tandem with speech processes. Only then can this system serve language acquisition productively.

Jakobson saw the same patterns in the development in knowledge of mathematics, not only of language, an idea that has since been followed up substantively by semioticians and mathematicians (for example, Marcus, 1975, 1980, 2003, 2010, 2013; Thom, 1975, 2010; Rotman, 1988, 1993; Varelas, 1989; Reed, 1994; MacNamara, 1996; Radford & Grenier, 1996; English, 1997; Otte, 1997; Anderson, Sáenz-Ludlow, & Cifarelli, 2000; Bockarova, Danesi, & Núñez, 2012; Bockarova & Danesi, 2014; Danesi, 2016). Intriguing research in the field of educational psychology, as will be discussed, have virtually corroborated Jakobson's approach and, by implication, the Saussurean notion of structure and its correlates (for example, Cho & Procter, 2007; Van der Schoot, Bakker, Arkema, Horsley, & van Lieshout, 2009).

2.1 Binary Structure

As is well known, Saussure saw the sign as a binary structure, composed of two parts—the signifier, which is the physical part of the sign, such as the actual sounds that make up a word such as *cat*, and the signified, which is the mental image that the sign elicits (literally "that which is signified by the sign"). So, forms such as *pat* and *cat* are decoded easily by English speakers as *signifiers* because they are perceptibly (physically) different in terms of the initial sounds. The ear (or eye) and brain pick this up because of the inner code that is involved, which consists of a differential cue in the initial /p/-/k/ contrast; then the sign-processing is completed, producing the signified, when its distinctiveness is mapped against the combination of the other sounds that constitute the two forms. This means that a signifier is associated with a mental image or signified concomitantly, so that the relation between the two becomes bidirectional or binary—that is, one necessarily implies the other. The word *tree* is a word in English because it has a recognizable phonetic structure that generates a mental concept (an arboreal plant). When we utter or hear the word *tree*

the image of an arboreal plant inevitably comes to mind, and, in fact, we cannot block that image from occurring; vice versa, when we see an arboreal plant the word *tree* comes automatically to mind. This is anecdotal evidence that both components of the sign (signifier and signified) exist in tandem, not separately. This model of the sign actually traces its origin back to the medieval Scholastics, who also viewed the sign (*signum*) as an identifiable form composed of two parts—a *signans* ("that which does the signifying") and a *signatum* ("that which is signified") (Nöth, 1990). The intrinsic relation that inheres between signs and the concepts they evoke is called *signification*.

Saussure claimed, moreover, that there is no necessary reason for creating the word *cat* or *pat* other than the social need to do so. Any other forms would serve the same purpose just as effectively, as long as they were constructed with the same structural code. For this reason, Saussure's binary model of the sign is called "arbitrary". In effect, there is no evident reason for using, say, *tree* or *arbre* (French) to designate "an arboreal plant". Any other well-formed word would do in either language. Without delving into the problems with so-called arbitrariness theory, for the present purposes suffice it to say that some sign systems are necessarily arbitrary at face value—for example, the binary numeral system is based on two signifiers 0 and 1 arbitrarily. In natural language, arbitrariness theory breaks down because of experiential, historical, and other contextual factors in sign construction and interpretation, as Peirce certainly knew (Peirce, 1931-1958). Saussure was obviously unaware of, or disinterested in, the role of sound symbolism in the formation of the core vocabularies of languages, which would impugn arbitrariness theory in the constitution of words; nor could he be, because its discovery as a primary force in language origins was made decades after his death by the linguist Morris Swadesh in the 1950s (see Swadesh, 1971).

One discipline that has implicitly adopted the Saussurean notion of binary structure is computer science—an area that is increasingly gaining the attention of programmers and semioticians alike (for example, Andersen, 1991; De Souza, 2005; Tanaka-Ishii, 2010). The theoretical blueprint for computer technology, as is well known, comes from Boolean algebra (Boole, 1854)—a system of symbolic logic based on binary relations. One of Boole's objectives was to break down traditional logic into its bare structure by replacing words and sentences (which bear contextual or categorical meaning) with symbols (which presumably do not). He reduced logical operations to binary relations—1 for *true* and 0 for *false*. American engineer Claude Shannon (1948, 1951) was developing switching circuits in the 1930s when he decided to apply Boolean algebra to control the circuits, which functioned in terms of a simple binary *off* (0)-vs.-*on* (1) symmetry, thus perfecting the architecture for modern-day digital computers. Shannon's logic gates, as he called them, represented the action of switches within a computer's circuits.

By the late 1960s, integrated circuits, electrical components arranged on a single chip of silicon, were manufactured, greatly enhancing the computation power of computers. This led in the 1970s to the invention of the microprocessor and the personal computer. It was in that decade that AI emerged as an autonomous discipline, aiming to examine how computing machines were built, including the principles used to make them work. At that point, it became plausible to model human intelligence as a function of these principles—hence the term artificial intelligence, as opposed to natural intelligence. The roots of AI were laid, actually, at a workshop at Dartmouth College in 1956, organized by John McCarthy, who is credited with coining the name of the new discipline. At the workshop, computer scientists presented and discussed the first

programs capable of modeling logical reasoning, learning, and other mental processes involved in playing board games, such as checkers. One presentation at the workshop described a program that learned to play checkers by competing against a copy of itself.

The point to be made here is that the origins of computer programs and even AI are ensconced in binary theory, and this finds its source in the Saussurean model of sign structure. All this raises a fundamental epistemological question: Does binary structure at face value account for the dualities that are dispersed throughout the natural world—two eyes, two hands, two hemispheres, etc.? Maybe Saussure unconsciously picked up on this duality as intrinsic to how we produce and comprehend sign systems. It may be somewhat of a stretch—albeit a plausible stretch—that binary structure is inherent in many perceptual and conceptual phenomena because our brain has binary structure, possessing two interactive hemispheres (the right and the left) which may be hypothesized as constituting the biological source of oppositional structure (Hubbard et al., 2005). One of the more relevant findings from the field of neuroscience is, in fact, that the right hemisphere (RH) is a crucial "point-of-departure" for processing novel stimuli: that is, for handling input for which there are no preexistent cognitive codes or programs available. This would corroborate a binary model of cognition whereby the sensory and the conceptual are interlocked into a paradigmatic tension. The neuroscientists Goldberg and Costa (1981) suggested that the main reason why this is so is because of the anatomical structure of the RH. Its greater connectivity with other centers in the complex neuronal pathways of the brain makes it a better "distributor" of new information. The left hemisphere (LH), on the other hand, has a more sequentially-organized neuronal-synaptic structure and, thus, finds it more difficult to assimilate information for which no previous categories exist. If this is indeed the case, then it suggests that the brain is prepared to interpret new information primarily in terms of a binary mode of processing.

3. Opposition Theory

Perhaps Saussure's most important discovery is that signs are constituted and understood through the psychological process of *opposition*. This feature of cognition is what allows us to perceive forms such as *cat* and *rat* as distinctive and meaning-bearing. The psychological importance of this feature was also noticed by the early psychologists, especially Wilhelm Wundt (1880, 1901) and Edward B. Titchener (1910). Saussure called it *différence*, seeing it as an intrinsic property of language. So, in psychological terms this means that we determine the meaning and grammatical function of a word such as *cat* by opposing it to another word such as *rat*. This shows not only that the initial consonants /k/ and /r/ are paradigmatically significant in English, but also what makes the word *cat* unique, pinpointing what *cat* means by virtue of how it is different from other words such as *rat, hat,* and so on. The set of these *différences* constitutes the system of meaning that we assign to the form.

Différence co-occurs with combination (as discussed). When putting together a simple sentence, for example, we do not choose the words in a random fashion, but rather according to their differential (paradigmatic) and combinatory (syntagmatic) properties. The choice of the noun *brother* in the subject slot of a sentence such as *My brother loves school* is a paradigmatic one, because other nouns of the same kind—*girl, man, woman,* etc.—could have been chosen instead. But the choice of any one of these for that sentence slot constrains the type—*love*-vs.-*drink*—and form—*loves*-

vs.-*loving*—of the verb that can be chosen and combined with it. Co-occurrence is a structural feature of all meaning-bearing systems.

As a theory of language, the notion of opposition was elaborated by a number of linguists who met regularly in Prague in the early 1920s. Trubetzkoy (1936, 1968), for example, called word pairs such as *cat-rat* that differed by only one sound in the same position *minimal pairs.* This technique became a central one in the ever-broadening field of linguistics at the time—remaining so to this day. Opposition was also used by the same linguists to examine higher-level contrasts such as synonymy (*big*-vs.-*large*), antonymy (*big*-vs.-*little*), taxonomy (*rose*-vs.-*flower*), part-whole relations (*handle*-vs.-*cup*), and so on. As psychologist Charles K. Ogden (1932, p. 18) aptly observed, "the theory of opposition offers a new method of approach not only in the case of all those words which can best be defined in terms of their opposites, or of the oppositional scale on which they appear, but also to *any* word." In the 1930s and 1940s, psychologists, semioticians, anthropologists, and linguists started noticing that opposition was not confined to language. It cropped up in the analysis of nonverbal systems and codes as well. For example, in the integer system of numbers, oppositions include *positive*-vs.-*negative*, *odd*-vs.-*even*, and *prime*-vs.-*composite*; in music, basic oppositions include *major*-vs.-*minor* and *consonant*-vs.-*dissonant*. In effect, any sign system possesses oppositional structure.

On the basis of their research, the Prague School linguists came to the conclusion that there were levels or orders of oppositions. In arithmetic, for example, the *addition*-vs.-*subtraction* opposition is the basic one while the *multiplication*-vs.-*division* opposition is a derived one—since multiplication is repeated addition and division repeated subtraction. The *addition*-vs.-*subtraction* opposition is thus a first-order, or binary, opposition and the derived *multiplication*-vs.-*division* opposition a second-order opposition that is part of a *quartic* opposition: *addition*-vs.-*subtraction*-vs.-*multiplication*-vs.-*division*. In an analogous vein, French semiotician Algirdas J. Greimas (1987) introduced the notion of the "semiotic square" to connect sets of oppositions—an idea that has migrated to several disciplines, including and especially logical analysis. Given a concept (for example, *rich*), Greimas claimed that we determine its overall meaning by opposing it to its contradictory (*not rich)*, its contrary (*poor*), and its complementary (*not poor*) in tandem. Also, as work with binary oppositions showed in the 1950s, there are gradations within the binary oppositions themselves, which are due to culture-specific connotative processes. So, for example between *night* and *day* there is *dawn*, *noon*, *twilight*, and other gradations. Thus, *night* and *day* came to be considered the "limiting poles" in a continuum of meaning; these are likely to be universal, while the gradations are culture-specific. Anthropologist Claude Lévi-Strauss also entered the debate on opposition theory in the 1950s by showing that pairs of oppositions often cohere into sets forming recognizable units. In analyzing kinship systems, Lévi-Strauss (1958) found that the elementary unit of kinship was made up of a set of four oppositions: *brother*-vs.-*sister*, *husband*-vs.-*wife*, *father*-vs.-*son*, and *mother's brother*-vs.-*sister's son*. Lévi-Strauss suspected that similar sets characterized units in other cultural systems and, thus, that their study would provide fundamental insights into the overall nature of human social organization.

The Prague School linguists also discovered that some phonemes occurred in many minimal pairs, while others did not. This came subsequently to be known as the "functional yield" of a phoneme. The phoneme /p/ in English has a high functional yield since it is distinctive in word-initial (*pin*-vs.-*bin*), word-internal *(open*-vs.-*oven*), and

word-final *(nap*-vs.-*nab*) position, and can be found in opposition with virtually every other consonant phoneme of that language. Research also showed that oppositions often revealed what came to be called "symmetry" (Pos, 1938; Jakobson, 1939; Trubetzkoy, 1939; Martinet, 1955). For example, the voiceless stops /p/-/t/-/k/ form a natural set. Within that set, each phoneme can be put in binary opposition with the others: /p/-/t/ *(*pin-vs.-tin), /p/-/k/ *(pin*-vs.-*kin/*, etc. Similarly, /b/-/d/-/g/ forms the corresponding natural set of voiced stops, which has a similar "set-internal" oppositional structure: /b/-/d/ *(bin*-vs.-*din)*, /b/-/g/ *(bet*-vs.-*get*), etc. Moreover, the consonants in the two sets can be put in opposition to each other: /p/-/b/ *(pin*-vs.-*bin),* /p/-/d/ *(pen*-vs.-*den)*, etc. The opposition-signaling feature between the two sets is, of course, [±voice]. This suggested to the linguists that phonological systems possessed symmetry. However, they also discovered asymmetries or gaps in such systems—in English, there exists an opposition between the voiceless dental and palatal sibilants, /s/-/ʃ/ (*sip*-vs.-*ship*), but since there is no voiced palatal consonant in that language, then there is no corresponding oppositional partner to the voiced dental sibilant /z/ (as in *zip*).

By conducting extensive analyses of this type, linguists started to notice that there were specific articulatory triggers in phonemic oppositions. For example, in /m/-/t/ the opposition was triggered by a *nasality*-vs.-*orality* contrast, but in /m/-/n/ it was triggered instead by a *bilabial*-vs.-*dental* differentiation. These came to be called "distinctive features". Thus, in the "cross-set" oppositions /p/-/t/-/k/ and /b/-/d/-/g/ the critical distinctive feature is [±voice]. Within each set, other distinctive features mark the oppositions: for example, the feature that kept /p/ and /t/, as well as /b/ and /d/ distinct, is [±labial]. Distinctive feature analysis became a mainstay in linguistic theories to this day, including within Chomskyan optimality theory (Jakobson, Fant, & Halle, 1952; Jakobson & Halle, 1956; Jakobson, 1968; McCarthy, 2001). Distinctive features were differentiated from redundant features, such as the aspirated [p^h] in English, which occurs in word-initial position only before a vowel: *pat, pot, pill, pin*, etc. If /s/ is put before the consonant, the aspiration is blocked: *spit, spill, spunk, spat*. Aspiration of /p/ is thus a predictable feature of English phonology—when /p/ occurs in word-initial position followed by a vowel it is aspirated. It is a redundant, not a distinctive, feature. Since the two phones, [p] and [p^h] are connected to each other in the way just described, they are said to be allophones that complement each other—where one occurs the other does not. The rule that specifies the way in which allophones complement each other came to be called a rule of complementary distribution.

Work on distinctive features led to a typology of oppositions. The main ones are as follows:

- A *multidimensional opposition* is one in which the distinctive features that are common to both phonemes also occur in other phonemes: for example, /p/, /t/, and /k/ share the features [+stop] and [-voice]; but they also share [+stop] with the [+voice] counterparts /b/, /d/, and /g/.
- A *one-dimensional* or *bilateral* opposition is one in which the features common to both phonemes do not occur in other phonemes.
- An *isolated opposition* is one that occurs between two specific phonemes but nowhere else in the phonemic system.
- A *proportional opposition* is one that is found in two phonemes and is repeated in other phoneme pairs: for example, /d/-/t/, /b/-/p/ = [+voice]-[-voice].
- A *privative opposition* is one in which pairs are distinguished by only one feature: for

example, /p/-/b/ = [±voice].
- A *gradual opposition* is one that involves varying degrees of a feature: for example the [open] feature of vowels.
- An *equipollent opposition* in which pairs are distinguished by several features, /b/-/ð/ and /v/-/g/ are distinguished by [±labial] and [±stop]

Sometimes, two phonemes can be shown to have oppositional status in certain minimal pairs, but not in others. In English, for example, the vowels /i/ and /e/ are phonemic, as can be seen in minimal pairs such as *beet-bet.* However, some speakers pronounce the word *economics* with an initial [i], others with an initial [e]. When this occurs, the two sounds were said to be in *free variation*, a phenomenon that is seen as having an "outside" or "extralinguistic" effect on the phonemic system. The actual pronunciation of a phoneme can, of course, also vary from speaker to speaker, which may be due to geographic, social, or other extralinguistic factors. All this suggested to the Prague School linguists, before the crystallization of sociolinguistics as a branch of general linguistics, that it may be possible to set up socially-variable oppositions. For example, an opposition such as *formal-informal* might manifest itself as a difference in pronunciation, vocabulary, or some other linguistic phenomenon.

As work in structuralism gained momentum throughout the twentieth century in linguistics, semiotics, psychology, anthropology, and other human sciences, inevitably the question arose as to the psychological validity of opposition. As interesting as it was, did it really explain how the mind creates forms and how signs are acquired? As discussed above, it was Jakobson (1942) who first tackled this question head on. By studying child linguistic development, he noted, for instance, that phonemic oppositions that occur rarely are among the last ones learned by children. Nasal phonemes exist in all languages. And, thus, they are among the earliest phonemes acquired by children. On the other hand, laryngeals are relatively rare and, consequently, are among the last phonemes to be acquired by children. Jakobson found many other features of linguistic development that fit in perfectly with the theory of opposition (Jakobson & Waugh, 1979). In effect, as Jakobson's work showed, the Prague School was starting to entertain broader implications of opposition theory before structuralism was marginalized by various movements within semiotics itself, of which the most critical was so-called post-structuralism, as will be discussed below.

A common critique of opposition theory has been that it does not take into account associative meaning and structure. The study of such structure came to the forefront starting in the 1970s within psychology and linguistics, cementing itself into the mainstream by the 1990s and early 2000s (Pollio, Barlow, Fine, & Pollio, 1977; Lakoff & Johnson, 1980, 1999; Fauconnier & Turner, 2002; Danesi, 2004). The American linguist George Lakoff (1987) and philosopher Mark Johnson (1987) are primarily responsible for this paradigm shift, claiming in 1980 that a simple linguistic metaphor such as "My brother is a tiger" cannot be viewed as a simple idiomatic replacement for some literal form, but, rather, that it revealed a conceptual systematicity. It is, more specifically, a token of an associative structure that they called a *conceptual metaphor*. This is why we can also say that *Sam* or *Sarah* or whoever we want is an animal—a *gorilla*, *snake*, *pig*, *puppy*, and so on—in attempting to portray his or her personality. Each specific linguistic metaphor ("Sam is a gorilla", "Sarah is a puppy", etc.) is an instantiation of an abstract metaphorical formula—*people are animals*. Now, does the existence of such formulas in cognitive activity lead to an invalidation of opposition

theory? Conceptual metaphors are formed through *image schemata*, as Lakoff and Johnson have cogently argued (Lakoff, 1987; Johnson, 1987). The image schematic source for the *people are animals* conceptual metaphor seems to be an unconscious perception that human personalities and animal behaviors are linked in some way. In other words, it is the output of an ontological opposition: *humans*-as-*animals*, rather than *humans*-vs.-*animals*. It constitutes, in other words, an example of how opposition manifests itself as an associative phenomenon, not just a binary or multi-order one. In this case, the two poles in the opposition are not contrasted *(*as in *night*-vs.-*day*), but equated: *humans*-as-*animals*. This suggests that oppositional structure operates in a non-contrastive way at the level of figurative meaning.

Lakoff and Johnson (1980) trace the psychological source of such polarity to *image schemata* that are produced by our sensory experiences of locations, movements, shapes, substances, etc. as well as our experiences of social events and of cultural life in general (Lakoff & Johnson, 1980, 1999; Lakoff, 1987; Johnson, 1987). Upon closer analysis, these turn out to be archetypal polar oppositions: *up*-vs.-*down*, *back*-vs.-*front*, *near*-vs.-*far*, *full*-vs.-*empty, balance*-vs.-*unbalance*, etc. Their manifestations occur in language ("I'm feeling up today", "Inflation is going down at last", "I'm full of memories", "My sense of timing is out of synch", etc.) and in other codes. For example, in music the *up-down* opposition is expressed by the fact that the higher tones express *happiness* and the lower ones *sadness*. This *up* is synchronized to *happiness* and *down* to *sadness* across the network of codes in a culture. Consider again the opposition *humans-animals* discussed above. In western culture, it not only surfaces in discourse about human personality, but also in the naming of sports teams (*Denver Broncos*, *Chicago Bears, Detroit Tigers,* etc.), which imparts a certain character to the team in terms of perceived animal qualities, in the utilization of fictional or cartoon characters *(Bugs Bunny, Daffy Duck,* etc.) to represent human personality types, in assigning surnames and nicknames *(John Fox, Mary Wolf*, etc.), and so on and so forth.

4. Markedness

The most severe critiques of opposition theory have revolved around the relative notion of *markedness* (Tiersma, 1982; Eckman et al., 1983; Andrews, 1990; Battistella, 1990). In oppositions such as *night*-vs.-*day*, it can easily be claimed that the "default" pole is *day*—that is, the notion in the opposition that we perceive as culturally or psychologically more fundamental. This pole is called the *unmarked* pole, and the other pole, the *marked* one (since it is the one that stands out). This analysis can be justified, arguably, because it has a source in human biology—we sleep at night and carry out conscious activities in the day. Now, the problem is deciding which pole is marked and unmarked in a socially problematic opposition such as the *male*-vs.-*female* one. The answer seems to vary according to the social context to which the opposition is applied. In patrilineal societies the unmarked form is *male*; but in matrilineal ones, such as the Iroquois one (Alpher, 1987), it appears to be *female*. Markedness, thus, seems to mirror social realities. Thus, its dismissal by various philosophers and semioticians, such as Michel Foucault (1972) and Jacques Derrida (1976), seems unwarranted. Their critiques led to the movement known as *post-structuralism*, which started in the late 1950s, gaining prominence in the 1970s.

In post-structuralism, oppositions are to be "deconstructed" (as Derrida put it), and exposed as resulting from an endemic logocentrism on the part of the analyst, not

the result of some tendency present in the human brain. In contrast to Saussure's idea of *différence*, Derrida coined the word *différance* (spelled with an "a", but pronounced in the same way), to intentionally satirize Saussurean theory. With this term Derrida wanted to show that Saussure's so-called discoveries could be deconstructed into the implicit biases that he brought to the analytical task at hand, because a science of language can never succeed since it must be carried out through language itself and thus will partake of the slippage (as he called it) it discovers. Derrida (1977, p. 237) claimed that oppositions deconstruct themselves when analyzed reflectively, that is, they fall apart, revealing their prejudicial origins:

> In idealization, to an origin or to a "priority" seen as simple, intact, normal, pure, standard, self-identical, in order *then* to conceive of derivation, complication, deterioration, accident, etc. All metaphysicians have proceeded thus: good before evil, the positive before the negative, the simple before the complex, the essential before the accidental, the imitated before the imitation, etc. This is not just *one* metaphysical gesture among others; it is *the* metaphysical exigency.

Derrida obviously failed to see that oppositions can be, and often are, reversible. Now that the dust has settled in semiotics, it has become increasingly obvious that post-structuralism was a blip on the radar screen of semiotic analysis. Today, markedness theory in particular has shown itself to be a viable approach to the nature of human thinking as it manifests itself in signs and sign systems.

Post-structuralism has had a profound impact on many fields of knowledge. Because written language is the basis of knowledge-producing enterprises, such as science and philosophy, post-structuralists claim that these end up reflecting nothing more than the writing practices used to articulate them. But in hindsight, there was (and is) nothing particularly radical in this diatribe against structuralism. Already in the 1930s, Jakobson and Trubetzkoy started probing the "relativity" of oppositions in the light of their social and psychological functions. Basing their ideas in part on the work of German linguist and psychologist Karl Bühler (1934), they claimed that language categories mirrored social ones. The goal of a true structuralist science, therefore, was to investigate the isomorphism that manifested itself between oppositions and social systems. In other words, opposition theory was the very technique that identified social inequalities, not masked them.

By the 1970s, work on opposition theory *per se* came to a virtual standstill, especially within semiotics, as so-called post-structuralism took center stage. The post-structuralist stance was fashioned as a direct assault on markedness theory, presenting a clear challenge to the whole notion of opposition and thus structuralism.

The term *information* invariably comes up in any discussion of oppositional structure. Although Saussure did not approach the notion of information directly, it is clear that he considered all raw data as information that was organized into meaningful structure. Cyberneticians were among the first to theorize information, as any form of data that can be received by humans, animals, or machines in both differential and common ways (Wiener, 1948, 1950; Ashby, 1956). At one level, information is seen as something probabilistic—a ringing alarm signal carries more information than one that is silent, because the latter is the "expected state" of the alarm system and the former its "alerting state". This binary state carries the information load through an opposition—*off*-vs.-*on.* In a schematic way this is consistent with the general notion of

opposition theory, whereby the alerting state would be called the marked state and the expected state the unmarked. The essence of the theory is that there exists a small set of binary concepts, such as *off*-vs.-*on, yes*-vs.-*no*, *right*-vs.-*left*, etc. that are encoded by the sign systems of cultures across the world.

As mentioned, the concepts that fall between the two limiting poles imply gradation or "gradience". For instance, in the *white*-vs.-*black* polar opposition, color concepts such as *yellow*, *red*, and *blue* are gradient ones since they fall between these two poles. This resonates with the research on color terms—words for the polar concepts (expressed in English with the terms *white* and *black* or *light* and *dark*) have been found in all languages; gradient ones (*yellow, green, pink,* and so on), on the other hand, show great variation across the world's languages.

Polar concepts form binary oppositions; gradient concepts may or may not (depending on use). In English, it is difficult to put, say, *yellow* into a binary opposition with another color, and if this is done it is a selection carried out for a specific purpose. Moreover, as Ogden (1932) pointed out early on in the development of opposition theory, some oppositions, such as *town*-vs.-*country*, are binary in some cultures, but not universal. These details and complexities need not occupy us here. Suffice it to say that opposition theory is a basic tool in semiotics and crosses over into cybernetics as well, as just discussed. In a mechanical cybernetic system, oppositions are strictly binary. Gradience is peculiar to non-mechanical systems, especially human ones. Research in cybernetics today, actually, aims to understand how gradience, as it is called in semiotics, might be simulated in artificial systems as well.

Obviously, the extension of markedness theory to other codes (music, gesture, mathematics, etc.) might reveal important psychological phenomena (see, for example, Schuster, 2001; Hatten, 2004; Vijayakrishnan, 2007; Danesi, 2008). A fascinating study by van der Schoot, Bakker Arkema, Horsley and van Lieshout (2009), for instance, examined the effects of the opposition *consistent*-vs.-*inconsistent* within a relevant arithmetic operation and markedness (the relational term being unmarked ["more than"] vs. marked ["less than"]) on word problem solving in a sample of 10-12 year old children differing initially in problem-solving skill. The researchers found that less successful problem solvers will utilize a successful strategy only when the relational term is unmarked. In another significant study, Cho and Proctor (2007) found that when classifying numbers as odd or even with left-right keypresses, performance was better with the mapping *even*-vs.-*right*-*odd*-vs.-*left* than with the opposite mapping. Calling this a *markedness association of response codes* (MARC) *effect*, the authors attribute it to compatibility between the linguistic markedness of stimulus and response codes. The MARC effect and its reversal are caused by a correspondence of the stimulus code designated as positive by the task rule with the positive-polarity right response code. Markedness has also been found empirically to play a role in language learning and development generally, discourse structure and in other areas of human cognitive, communicative and representational activity. Overall, the work on markedness in human conceptualization generally validates Jakobson's initial findings, or at least their general implications—namely that opposition theory is a psychologically predictive and diagnostic tool.

The analysis of the interconnections between linguistic oppositional structures and cultural-cognitive modalities was always implicit in the work of the Tartu School of semiotics (Lotman, 1991; Andrews, 2003; Lepik, 2008). Lotman was among the first to envision culture as a system of interconnected sign systems shaped by oppositions

that spread out into a unified network of connotations. As an example of how a single opposition might be so encoded, consider the *right*-vs.-*left* one (Needham, 1973). Arguably, this is derived, anatomically, from the fact that we have a left hand (and foot, leg, ear, and eye) and a right one. Now, this anatomical fact has been encoded in an opposition that carries a markedness criterion along with it—*right* is unmarked and *left* is marked. Here are a few of the ways in which this surfaces culturally. First, it intersects with other oppositions—*right* is associated with *good*, *light*, etc. and *left* with *evil*, *dark*. This indicates why we associate "leftness" with "evil" and both of these with "darkness", and so on, and why, by contrast, we associate "rightness" with "goodness", "light", and so on. The associations are connotative, and are thus involved in generating rhetorical, aesthetic, and other textual structures. The list of the manifestations of the *right-left* oppositional network is a huge one. Cumulatively these would show that our conceptual, representational, aesthetic, and ritualistic systems are interconnected in oppositional ways through connotative synchronizations of this type.

Now, the question of the origin of such connotative systems can be raised. The plausible reason why we have come to assign positive values to the *right* pole in the *right-left* opposition and negative ones to the *left* pole probably stems from the fact that the majority of human beings use their right hands instinctively from birth to carry out routine tasks. Only about 10 percent of people are naturally left-handed. As a consequence, the right hand is perceived to be the default form of human handedness. However, in a society where left-handedness is the norm (should there be one), then the marked pole would be reversed to *right* in the oppositional scale. Determining which member of a pair is the unmarked form and which one the marked one is a matter of tradition and history. *Good*, for example, has always been assumed to be the default form of human behavior in many societies, while *evil* has always been perceived to be its antagonistic counterpart. And, by and large, people living in communities aspire to conduct themselves for the betterment of the community, while a few do not. Narratives, paintings, and the like bring this out either directly or satirically (as the case may be).

This type of analysis has been called "Systems Analysis" (SA) by Sebeok and Danesi (2000). One of the tasks of SA is to document and investigate how oppositional systems mirror brain structure and its archetypal basis, since as discussed previously, an archetype forms an oppositional structure in the unconscious part of the mind. Archetypal oppositions that seem to have universal status include *masculine*-vs.-*feminine*, *light*-vs.-*dark*, *good*-vs.-*evil*, *self*-vs.-*other*, *subject*-vs.-*object*, *sacred*-vs.-*profane*, *body*-vs.-*mind*, *nature*-vs.-*culture*, *beginning*-vs.-*end*, *love*-vs.-*hate*, *pleasure*-vs.-*pain*, *existence*-vs.-*nothingness*, *left*-vs.-*right, something*-vs.-*nothing,* among others. Another main task of SA would be to determine which concepts are polar and which are gradient. Consider bodies of water. In English, words such as *lakes, oceans, rivers, streams, seas, creeks,* and so on are used commonly. These are gradient concepts located on a *water*-vs.-*land* oppositional scale. Now, people living in the desert have very few words for bodies of water, for obvious reasons. So, such concepts would not play as much of a role in their culture as they do in others. In the latter, further oppositional refining, as it may be called, emerges. For example, size may enter the classificatory picture to produce lower-level conceptual oppositions—*ocean*-vs.-*lake*—as does width and length—*river*-vs.-*stream*—among other features.

5. Concluding Remarks

A dichotomy between Saussurean and Peircean models of the sign is sometimes

emphasized; but this is an unnecessary emphasis, since they are complementary. As discussed, opposition theory is found throughout the domain of the human and cybernetic sciences today, including metaphor theory, at least implicitly. It allows us to identify and recognize forms as meaning-bearing; Peircean theory allows us to understand the experiential sources of these forms and how they allow us to interpret the world. The Peircean approach has in no way ever been antithetical to structuralism, with various attempts having been put forward to reconcile it with Saussurean semiotics in various domains, such as mathematical cognition, as discussed above.

The philosophical blueprint of opposition theory can be traced back to the concept of dualism in the ancient world (Hjelmslev, 1939, 1959; Benveniste, 1946). Dualism found its way into Cartesian philosophy in the sixteenth century—a philosophy that went so far as to claim that the mind and the body were separate entities, as is well known. But the Cartesian view was more of an aberration than a continuation of ancient dualism, which actually sought to understand the relation between the body and the mind, not their independence. Certainly, the kind of dualism envisioned by the early structuralists was not Cartesian in any sense of the term, since it actually suggested that signs were produced by the body and mind in a synergistic fashion. Their research agenda led to the establishment of structuralism in psychology and to its theoretical cross-fertilization in semiotics, linguistics, and anthropology. Saussure's principle of *différence* provided the first scientific and thus testable method for determining the nature, functions, and meanings of oppositions. As we have seen, it has been used to carry out extensive analyses of languages and other semiotic systems and to establish universal patterns in structure. The questions that opposition theory raises are highly relevant to current work and thinking in the human sciences: Does oppositional structure exist in reality or is it projected onto reality by the human mind? Is human cognition itself oppositional, as reflected in the fact that the brain has two hemispheres that process information in a complementary binary fashion? By revisiting the theory, and expanding it to encompass new forms of research in both semiotics and psychology, it may be possible to answer such questions concretely.

Andrews (1990) has argued that opposition and markedness theory allowed us to detect patterns of universal structure and meaning connecting language, mathematics, and other representational systems. Battistella (1990, 1996) has claimed that it could be enlisted to explain several seemingly unrelated processes in linguistic change and that its extension to the study of conceptual structure and cultural representation could provide valuable insights into the relation between thought, language, and culture claiming that sentences and texts revealed a basic oppositional structure in their conceptual form. Mettinger (1994), for example, conducted an in-depth empirical study of forty-three English-language novels, from which he isolated ten syntactic frames that he claimed were based on oppositional structure. He concluded that there were two kinds of conceptual oppositions, systematic and non-systematic, and that these played a crucial role in narratives. As Battistella (1990, p. 2) observes, the principle of markedness comes from the fact that "the terms of polar oppositions at any level of language are not mere opposites, but rather that they show an evaluative nonequivalence that is imposed on all oppositions". Psychologically, markedness has many profound implications. Above all else, it constitutes an unconscious conceptual reflex that subsequently guides language form and use. For example, when an opposition such as *tall-short* is involved in a speech situation, we ask instinctively "How *tall* are you?" not "How *short* are you?" because, unless there is a specific

reason to do otherwise, we assume *tallness* to be the default unmarked pole, while the other pole, being exceptional or constrained, is perceived as the marked one.

Opposition theory has always found special fertile ground in the study of media (Barthes, 1957). Essentially, as Barthes demonstrated, it allows media analysts to flesh out the hidden meanings built into texts. Take, for example, the differences that are associated with the *white*-vs.-*black* opposition. The former connotes positive values, while the latter connotes negative ones in western culture. This opposition manifests itself symbolically in all kinds of media texts. In early Hollywood cowboy movies, for example, heroes wore mainly white hats and villains black ones. Interestingly, Hollywood also turned the poles of an opposition around, every once in a while, in order to bring out the same pattern of connotative nuances even more forcefully. This is why the *Zorro* character of television and movie fame wears black, as did several Hollywood western heroes of the past (such as *Lash Larue*).

In sum, a Saussurean approach to sign systems is still a valid one today and has found its way into the fabric of many disciplines, whether they know it or acknowledge it as such. It is essentially a theory of mind that focuses on how the brain perceives signs and how they are constructed. Perhaps the most important question of all that it raises is the following one: Is oppositional structure in the mind? In other words, do we understand the world in oppositional terms because our brain is structured that way or is the world itself oppositional in structure and all we are doing is discovering how this is so? Saussurean semiotics does not tackle this question directly, of course. Rather, it limits itself to a less-grandiose scheme—describing the structures that undergird any attempt to answer it.

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