

ENCYCLOPEDIA OF SEMIOTICS

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Editor in Chief

OXFORD UNIVERSITY PRESS

New York 1998 Oxford

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—FERNANDO POYATOS

PARALLELISM. As a figure of style, of interest to rhetoric and literature, parallelism provides means to emphasize and suggest relations by using repetitive patterns, mirrored sentences, or paraphrases. Its aim is often to balance one literary element with others of equal significance. Literary semiotics has identified such examples in the oral poetry of almost all known cultures and in the entire history of literature. During rhetoric-dominated forms of literary expression, parallelism flourishes.

In somewhat related terms, an entire aesthetics is built around a variation of parallelism within the symbolic movement in the arts. This aesthetic holds that the inner nature of humanity can be expressed most effectively by repetitive patterns, including parallel lines, that symbolize the order—which some see as mystical—that underlies nature. The Swiss artist Ferdinand Hodler (1853–1918), influenced by symbolist poetry, painted under the guidance of this aesthetics of parallelism. Many other artists followed his example, if not necessarily the concept.

By no surprise, parallelism strategies of emphasis are used widely in the fields that have become the mass media, especially advertising. The types that emerged are synonymic (using words or images or sounds in subtle repetitive patterns), antithetical (choosing one thing against another presented in a parallel manner), and synthetic (synthesizing a selection from the parallelism of presentation). Some advertisements combine parallel synonymic expression, antithetical figures, and synthetic strategies.

Also seduced by the metaphor of parallelism, philosophers for the longest time entertained the notion that material and spiritual phenomena take place in parallel, though separate, sequences. While along each sequence there are causal connections, one can at best state correlations between the two streams of occurrences. In the attempt to understand

the relation between the body and the mind, this view focused on the relation between physiological processes and what would eventually be called cognitive or mental processes. Parallelism holds that mental changes correlate with neural modifications—the firing of a neuron is the most recent expression, inspired by the experience of electronic circuitry. No apparent determinist connection can be further assumed between cognitive or conscious processes and what takes place in the nervous system. This view offers an alternative to theories of interaction in an effort to avoid difficulties arising from explanations based on assuming that correlations are actually interrelationships. In none of the parallelism-based body-mind theories is a spiritual substance, a substantial soul, or a homunculus either implied or accepted, but a variety of theories evolve around an assumed though not evident underlying entity through which unity is reached. Therefore, mind and body can be seen as fundamentally identical, while the parallel mental and physical processes embody aspects of unified real processes.

The psychophysical conception, at least as varied as the philosophy of parallelism, rests more radically on the assumption of a one-to-one correlation between events in nature (the physical world) and mental states. Gottfried Wilhelm Leibniz (1646–1716) is the originator of this idea. A more nuanced view refers to the parallelism and the refined correlation between psychoses, affecting individual minds, and neuroses. Suggested within this view is that processes such as physicochemical changes or neural activity might not have cognitive correlates.

Credited to Gustav Theodor Fechner (1801–1887) (*Zendavesta*, 1851, book 3, chapter 19), the term *parallelism* came into use after the thought it labels had literally propagated from the philosophy of ancient Greece to the religious concepts of the Middle Ages and to Baruch Spinoza's (1632–1677) *Ethics*, in which the doctrine seems to have been first articulated explicitly. The notion of correlation adopted by the Scholastics and occasionalists was reactivated in debates—triggered by the psychological experiments of Wilhelm Wundt (1832–1920)—over the nineteenth-century idealist philosophy of Friedrich Schleiermacher (1768–1834), Friedrich Adolph Trendelenburg (1802–1872), Friedrich Beneke (1797–1854), and Eugen K. Dühring (1833–1921). The solution advanced reflected the obsession in the humanities for a scientific foundation, similar to that of the sciences

but not so crude as to reduce the complexity of psychic phenomena to a mechanistic explanation of the relation between such phenomena and the brain's activity. The neo-Kantians and the empiricists of the nineteenth century were quite critical of the doctrine of parallelism, but there were also arguments in its favor, especially from within the emerging hermeneutic philosophy. Wilhelm Dilthey (1833–1911), extending the work of Franz Brentano (1838–1917), and William James (1842–1910) both ascertained that a localization and explanation of conscious connections could not be accomplished from physiological laws. Each time new objections against parallelism were raised—and there were plenty of these—its proponents ended up refining the initial thought.

The basic explanatory model is attractive on account of its clean answers to exceptionally complex problems. That some aspects of human psychology or psychic activity are describable in terms of parallelism seems clear now, as does the understanding that there is more to human psychic processes than parallelism can explain. "In short, from our perspective, conscience is a system of implications (among concepts, affective values, etc.) and the nervous system is a causal system, while psychophysical parallelism is a special case of isomorphy between implications and causal systems," wrote Jean Piaget (1896–1980) in 1950. When conclusions are drawn through conscious processes from precise premises, the result is based on the logical content of the premises, not on the basis of some causality that leads from the premises to the inference. This makes psychophysical parallelism the place where the circle of science from deductive mathematics to realistic inductive biology closes and in which psychology and sociology take intermediate positions.

More recently, this discussion was refined further through the implication of emergent properties or characteristics. William C. Wimsatt (1976), taking a cybernetic viewpoint, has drawn attention to the tripartite construct "hardware-software-program performance." The psychophysical problem can be seen at the levels of neuronal processes, the functional performance of a brain in the sense of a program, and behavior. It remains unclear to what extent the architecture of a computer program is comparable to an organism's cognitive performance and to what extent the brain's physiological organization imposes conditions upon the design of the program. In the terminology of the older controversy around parallelism, this can be restated as the question

of to what extent physiological sequences, mental processes, and artificial-intelligence modeling are isomorphic or whether they are bound to create conditions for their reciprocal emergence. The new critics of parallelism (Roger W. Sperry, Karl Popper, John Eccles, John R. Searle) tend to accept the emergence view. This bird's-eye view of the subject as it unfolded over time and in various theoretical approaches obviously omits some of the successive views (probably parallel themselves) that eventually crystallized in the Gestalt theory, in post-Piaget cognitive projects, and in some of the more recent attempts within the neurosciences, especially chaos-theory models of brain activity.

From a semiotic perspective, parallelism is of extreme interest in view of the difficulties encountered in defining the sign (standing in parallel to what it designates), sign typologies (resulting from the type of representation), and sign processes. While we assume an operational view of sign processes, we really do not know where and how they take place. Semioticians might indeed face the challenge of choosing between the "Scylla of parallelism and the Charybdis of interaction," as J. B. Watson expressively defines these two positions. Or, adopting a logical-positivist perspective of semiotics, similar to work by Rudolf Carnap (1891–1970), semioticians might, in sync with the new cognitive theories, discard parallelism altogether, since there are many parallel occurrences that offer little if anything to either our understanding of complex sign systems (such as language) or of their actual functioning in various pragmatic contexts.

Nevertheless, here the challenge of parallel computation emerges. The so-called Von Neumann paradigm of computation states that the human mind does not operate sequentially but in parallel processes. The element of simultaneity is essential in both understanding and implementing parallelism. The two major types of parallel computation are defined by the data processed. Either all parallel processors operate in the same way upon homogeneous data—a new type of brute-force processing—or they execute truly parallel different operations upon a variety of data. In some cases, this leads to very sophisticated connections among different simultaneous or successive processors. Another distinction refers to the granularity of the process: macroparallelism (of a limited number of processors) is quite different from microparallelism (of a vast number of processors).

New concepts of distributed computation overlap with parallel processing. On the one hand, there is

the need to decompose problems into smaller parts, each to be operated upon in parallel in a distributed environment. On the other hand, there is the need to address synchronization and communication among these distributed tasks. While computer science met the challenge of designing powerful systems based on the expectation and requirement of parallelism, semioticians are still shy about taking advantage of technological progress in order to address questions pertinent to their own field of inquiry. The basic known semiotic theories imply that human beings operate in parallel upon various simultaneous signs and that semioses are parallel and distributed processes. Elements of semiotic correlation could be understood if, using the knowledge gained in designing both parallel processors and algorithms for parallel processing, semioticians would revisit sign theories. In many ways, these new cognitive engines are semiotic machines on which some of the hypotheses advanced to date could be effectively evaluated or through which new theories could be formulated.

[See also Algorithm; Computer; Connectionism; and Sign.]

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—MIHAI NADIN

PARIS SCHOOL. The structuralist movement in French semiotics that developed in Paris in the early 1960s around Algirdas Julien Greimas (1917–1992) and Roland Barthes (1915–1980). Barthes, however, definitively distanced himself from Greimas and his followers with the publication of *S/Z* (1970). The designation "Paris School," which replaced the earlier "Groupe de Recherches Semiolinguistiques," first appeared in print in 1982 in a book edited by Jean-Claude Coquet. In his detailed, programmatic first chapter, Coquet both retraces the history of the movement—which began in 1956 with two articles published by Greimas—and outlines an agenda for the future. What distinguishes the Paris School from other Saussurean, Hjelmslevian, or Peircean movements that consider semiotics the theory of signs or the study of signs' and symbols in various fields is that the Paris School's proponents define semiotics as a theory of system of signification. Rather than as an observable phenomenon or a given, the sign is considered first of all as a construct. This point of departure has crucial theoretical and practical consequences.

From the early 1960s, Greimas's position among other European linguists who were working mainly within the theoretical framework of generative and transformational grammar was somewhat unique insofar as he adopted a semantic point of view and extended the syntactic "generative" perspective to the semantic domain. The elementary structures of signification form the basis of this model. As Coquet (1982) notes, the discursive or transphrastic (beyond the sentence) model develops the principle of narrativity that constitutes a fundamental level for the organization of discourse. Within the framework of such a narrative semiotics, transformations are both intratextual and syntagmatic. This is illustrated most clearly in Greimas and Courtés's *Semiotics and Language* (1982), a dictionary of the theory in which semionarrative transformations are defined, as complementing the intratextual and paradigmatic Lévi-Straussian transformations without contradicting them. Transformations are thought of as logical operations when they are located at the level of deep semiotic structures. They are described as shifting from "one term of the semiotic square to another, carried out through the operations of negation and assertion" on the logicosemantic plane and are interpreted as operations of conjunction and disjunction between subjects and objects of value at the