ENCYCLOPEDIA OF
SEMIOTICS

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drawings with extensive commentaries and allusions. It would be more fruitful to see the verbal and the visual either as polar extremes along a continuum or, better, as two related but distinct dimensions.

[*See also* Comics; Face; Hjelmslev; *and* Pictorial Semiotics.]

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—RAY MORRIS

CASSIRER, ERNST

CASSIRER, ERNST (1874–1945), German philosopher who taught in Berlin, Hamburg, Oxford, and Göteborg before emigrating to the United States in 1941, where he held visiting professorships at Yale and Columbia Universities until his death. In Cassirer's rich trove of ideas pertinent to semiotics, there are a few that qualify him as a visionary. Today, his name is associated with those who are making the networked world a captivating reality. Cassirer

himself—more a classicist than an innovator—would probably be confused by seeing his philosophy conjured up in the analysis of multiuser dungeons (MUDs), which involve dialogue between virtual personae that are embodied in textual expressions. Cassirer's work is also referred to by scholars involved in the semiotic issues of representation as they try to emulate human intelligence. Still, Cassirer's work in semiotics remains little known, although some modern semioticians (Jurij Lotman, Roland Barthes, and Umberto Eco among them) have pursued themes and notions that bear his imprint: symbolic expression, the study of the myth, and culture as a semiotic system.

Cassirer's work makes up a large body of philosophic elaborations that is almost Renaissance-like in scope, starting with his dissertation, *Descartes' Critique of Mathematical and Natural Scientific Knowledge* (University of Marburg, 1899) and culminating with *The Philosophy of Symbolic Forms*, the fourth and final volume of which was published posthumously. His oeuvre is difficult, with many digressions, and covers philosophic subjects ranging from themes originating in ancient Greek philosophy to the subjects of existentialism, positivism, and epistemology.

Commentators on his work place Cassirer between neo-Kantianism (probably in view of the influence of his mentor, Hermann Cohen, head of the Marburg school) and phenomenology. (He takes a position close to that of Edmund Husserl in supporting a logic free of psychological components). The focus of his inquiry is on knowledge, although his philosophic interrogation expands into the study of myth, language, art, religion, humanities, and the theory of science, and he provides generous amounts of historic context for the objects of his investigations. Cassirer is preoccupied with the constitution of knowledge and its expression, and accordingly his territory is not the object domain but the metadomain.

In Cassirer's view, philosophy and science evolve from myth. Nevertheless, the mythical world is of extreme richness and is therefore more dynamic than that of our theories and infinitely more impregnated with emotional qualities. "Science, the last step in man's mental development" appears to Cassirer as both the "highest and most characteristic attainment of human culture" and the expression of a particular condition summed up in what he called *animal symbolicum*, by which human beings are understood as symbolic animals.

For Cassirer, the symbolic and the semiotic are equivalent. This conception leads him to the popular assumption that all signs are symbols. While not eager to further differentiate in the realm of signs (as many of his illustrious contemporaries did), he nevertheless set the foundation for what later became the obsession with semiotics as a universal science. Robert Hertz (1881—1915) and Hermann von Helmholtz (1821–1894) were his precursors in defining symbols as objects of scientific inquiry: "These symbols are so constituted that the necessary logical consequences of the image are always images of the necessary natural consequences of the imagined objects." Transcending the functional level of existence (the world of signals, receptors, and effectors), the symbolic system is an artificial realm: "The fundamental concepts of each science, the instruments with which it propounds its questions and formulates its solutions, are no longer regarded as passive images of something, but as symbols created by the intellect itself."

Significance (*Prägnanz*, which in German involves also pithiness, precision, and meaningfulness) is correlative to the symbolic form. It is an aspect of symbolic activity and one of its goals. A symbolically significant experience (such as cause, time, or space) conveys meaning and becomes part of self-consciousness. Symbolic significance is a relational notion.

In this vein, Cassirer's semiotic elaborations become visionary, and this contribution makes his work attractive to current researchers in artificial intelligence and other fields of advanced scientific inquiry. Unfortunately, his contribution has been of less interest to semioticians, who at times appear more concerned with justifying the implicit legitimacy of their endeavors than with the significance of semiotics for those working outside it. Cassirer is quite blunt in observing that "science does not mirror the structure of being," thus continuing the post-Kantian critical examination of how knowledge is attained and of its significance.

Cassirer carries through a notion of symbolic productivity that resonates in today's attempts to build effective computational procedures rooted in constructivist philosophy:

The logic of things, i.e., of the material concepts and relations on which the structure of science rests, cannot be separated from the logic of signs, for the sign is no mere accidental cloak of the idea, but its necessary and essential organ. It serves not merely to communicate a complex and given thought process, but is an instrument, by means of which this content develops and fully defines itself. . . . Consequently, all truly strict and exact thought is sustained by the symbolic and semiotics on which it is based. (1960–1964, vol. 1, p. 85)

It would be risky, however, to construe these speculations as a comprehensive foundation for modern cognitive sciences. Rather, we should see them as parts of a conceptual structure, subject to further refinement. Cassirer's work bears the burden of those who illuminated his thinking, from Giambattista Vico, Johann Gottfried Herder, Hermann von Helmholtz, Georg Simmel, and Hermann Cohen to Albert Einstein. Cassirer in turn influenced many of the scholars who gave modern semiotics its own legitimacy. M. I. Kagan, who was influential within what became the famous circle around Mikhail Bakhtin, upon returning from Germany identified Cassirer as an influence on his philosophy of language. It is probably too late for some of Cassirer's less-appreciated ideas to further advance the field. Nevertheless, some of his writings will continue to be read as almost prophecies that have been borne out: "Physical reality seems to recede in proportion as man's symbolic activity advances. Instead of dealing with things themselves, man is in a sense constantly conversing with himself. He has so enveloped himself in linguistic forms, in artistic images, in mythical symbols or religious rites that he cannot see or know anything except by the interposition of this artificial medium" (1962, p. 25). Our current world is, indeed, one in which the "tangled web of experience" is expanding as we continue to "weave the symbolic net" of our interconditioning and interdependency. More than a semiotic awareness of symbolic forms, Cassirer made possible a cognitive self-awareness based on semiotic assumptions.

[*See also* Barthes; Burke; Cultural Knowledge; Eco; Lotman; Metalanguage; Metaphor; Myths; *and* Whorf.]

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—MIHAI NADIN

CATASTROPHE THEORY. French mathematician René Thom's natural, realist philosophy is governed by the two central principles of structural stability and morphogenesis. The importance of catastrophe theory (CT) to linguistics and semiotics—an issue Thom himself has expounded—comes from the fact that it is most directly concerned with structures. The theory has essentially to do with the effect of local (quantitative, micro) variations on the global (qualitative, macro) structure. Catastrophe theory involves the description of the sudden, abrupt discontinuities induced by the continuous local perturbations of a system. As per Thom's theorem, "the number of qualitatively different configurations of discontinuities that can occur depends not on the number of state variables, which is generally very large, but on the control variables, which is generally very small. In particular, if the number of control variables is not greater than four, then there are only seven types of catastrophes, and in none of these more than two state variables are involved" (Saunders, 1980, p. 3). The seven elementary catastrophes are fold, cusp, swallowtail, butterfly, elliptic umbilic, hyperbolic umbilic, and parabolic umbilic, each of which has a corresponding topology.

For Thom, the universe is characterized by constant and incessant interactional dynamism in the physical and biological domains. This infinite flux is not, however, to be taken as universal chaos. The process can be grasped in terms of structures that are at least momentarily stable. The stable structures are the interactionally dynamic morphologies that come to be and disappear. Thus, the universe does not consist of things but of the constant creation and destruction of stable forms—in other words, a continuous process of morphogenesis, which denotes the appearance of organic forms during the course of evolution; in more general terms, it denotes "any process creating (or destroying) forms" (Thom, 1983, p. 14). These forms do not vary infinitely, however, since their possible variety is constrained drastically by the four dimensions of space and time in the natural world. We can identify a restricted set of morphologies arising from basic physical and biological interactional dynamics. These are the archetypal morphologies assumed to be universally valid and extensive across the physical, biological, cognitive, and linguistic domains.

Correlative to the understanding of the universe as consisting of forms that are continuous, dynamic, irreducibly gestaltlike, and defined by their stability of structure, Thom's notion of meaning integrates its physical and cognitive aspects without setting up an exclusively linguistic level. The central problem that Thomian semantics addresses is that of the gap that arises between the physical reality and its phenomenological presentation. This gap, referred to as the "scission between phenomenology and physics" stems from the fact that though the physical world is perceived in its essential continuum, (i.e., as a totality of things and their relations), its description in language suffers some sort of a fracturing, an inevitable discretization by means of apparently disjoined lexical elements. For Thom, the syntax that is primarily a means of recapturing this continuum is generated from a semantic level that is also the deep conceptual syntax. His approach, based on a study of "interactional morphologies," is intended to develop an appropriate formalization of the semantic syntax of natural languages.

The importance of archetypal morphologies for linguistic theory comes from how they account for deep syntax in a deductive manner. The surface structures defined in terms of the formal combinatorics of the syntactic categories (noun, verb, etc.) do not capture the interactional dynamism that characterizes the semantic level. Meaning has its source in the real physical/biological occurrences that emerge as surface linguistic structures via the archetypal morphologies. This is what Jean Petitot (1985) has called the "morphogenesis of meaning."

Thom's basic claim is that there is a mediation between the physical, the cognitive, and the linguistic domains that can be understood in terms of morphological organization, or rather through the morphologies of interaction. The latter, rather than belonging to any one of the domains, are "rooted in