ABSTRACT. — We attempt to summarize some of the work of the mathematician René Thom with respect to his work in semiotics, linguistics and his philosophy as it pertains in these areas of his endeavours. A brief summary of his work in semiotics and linguistics is presented followed by Thom’s philosophical and other thoughts which make up, in our opinion, the core of his philosophical work in these areas of human thought.

KEYWORDS: René Thom, Semiotics, Linguistics, Natural Philosophy

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Introduction

In an article (Bourguignon, 2004: 1), the [former] director of the French institute for advanced scientific studies (the I.H.E.S.) remarked that René Thom (who worked at the institute) called himself a mathematician and an apprentice philosopher. I believe that he also could have added the title ‘apprentice semiotician’. Thom died in 2002. He was an important intellectual in French circles and was awarded many honours and prizes. In 1958, he was awarded the Fields Medal, the ‘equivalent’ to the Nobel prize for his mathematical work on cobordism, a mathematical theory Thom created as a way of classifying manifolds thereby linking algebra and geometry.

His greatest fame came when he created Catastrophe Theory. It has been described as a method, a language and a theory of models that aims to explain how the seemingly placid and predictable (the continuous) suddenly give rise to the drastically different (the discontinuous); how continuous causes can give rise to discontinuous effects. His work centred around asking some central question: what is general and what is singular? What does it mean for something to be ordinary, and when can we say something is exceptional? Using his geometry (topology), Thom’s achievement was to define precisely (mathematically) what it means for a property to hold in general (he called these properties generic). He also devised a useful tool to check whether a given property is generic, so now instead of looking for properties that are always true, one can try to find properties that hold in general, that is, that are generic. Thom also asked if a situation is exceptional, how exceptional is it? This led him to develop a general theory of models that the British topologist E. Christopher Zeeman [1925-2016] named Catastrophe Theory (CT). Thom’s ultimate scientific and philosophical research program was to build up a general theory of intelligibility and to use CT to geometrize thought and linguistic activity. Only a mind such as Thom’s could have conceived it.

§ 1. — On Semiotics and Linguistics

Thom’s project may be paraphrased as ‘so far, scientists have done nothing but change the world in various ways, now we must interpret it!’ In a review of Thom’s seminal book, Structural Stability and Morphogenesis: A General Theory of Models, Brian Goodwin [1931-2009], a theoretical biologist, wrote, “What we are offered is a new mathematical metaphor created by Thom in response to the challenge of rendering intelligible the world of structure and form.” (Goodwin, 1973: 207). In (Goodwin, 1983: 93), he writes, “R. Thom’s cognitive programme is to geometrise thought itself....
His objective is to create a theory of meaning whose nature is such that the act itself of knowing is a consequence of the theory; i.e., when an appearance appears to us as a bearer of meaning, we will know why and to what formal acts to attribute it”. [For more on a theory of intelligibility, see (Espinoza, 2020.)]

In this article, I would like to present, in the main, some comments various authors have made about Thom’s work in semiotics and linguistics, and then give some of Thom’s thoughts culled from his English writings. My hope is that this will pique the interest of students studying semiotics and linguistics to learn more about Thom’s work in these areas.

Tom Sebeok, a contemporary of Thom, says in his book Signs and Its Master, “I regard the semiotic intimations of the French polymath Thom as pure nuggets of gold, in the aggregate containing the sole contemporary pointers toward the elevation of our doctrine [of signs] to the status of a theory or a science”. (Sebeok, 1979: viii) On page xix, he writes, “Thom’s new contributions become so immensely valuable, elevating, however hesitantly, the problem area out of its metaphysical trappings into the realm of geometry”. He continues, on page 62, with, “Thom’s importance for a general semiotic theory lies in the ‘semiotic extension’ of natural patterns to thought patterns and in a theory of symbolism which adheres closely to the Peircian semiotic model”.

[Sebeok invited Thom to give a lecture, I believe in the late 1970s, at the Bloomington campus of Indiana University (where Sebeok worked). Cassette tapes of this lecture are available at the university library.]

In (Sebeok, 1977a: ix), Sebeok writes that “semiosis must of course conform to the Universal Laws of Thermodynamics as René Thom—who was strongly influenced by both Peirce and Uexküll—has lately shown in several landmark contributions, rooted in topology, that surely betoken the most consequential turning point in the history of semiotics since Peirce”. Regarding zoosemiotics, Sebeok comments, “Human evolution is thus not only a reconfirmation of the evolutionary processes which went on before man appeared on the scene, but continues as a dual semiotic consecution that can scarcely be uncoupled in practice: one track language-free (or zoosemiotic); the other language-sensitive (or anthroposemiotic). Semiosis must be recognized as a pervasive fact of nature as well as of culture. In such matters, then, I declare myself not only a Peircean but a (René) Thomian.” (Sebeok, 1977b: 183). In a concluding thought, he writes, “Thom’s outline of a general theory seems to me to provide the first rigorously monistic model of a living being endowed with the *facultas signatrix*, and
to offer one pure topological continuum in which causality and finality are combined. Assuredly, it is no accident that his dynamical topology was influenced by Peirce ... and Von Uexküll.” (Sebeok, 1977b: 185)

Alain Rey, writing in (Sebeok, 1978: 107-108), says, “The general patterns of mathematics or logic belong to another type of epistemic relation in which the structures of the human brain are related to the structures of the world as objects-to-human knowledge (which is the only possible meaning of ‘world’). Here, semiotics, as René Thom’s stimulating work appears at last in the abstract patterns through which phenomena are represented.”

Eugen Baer, writing in *Semiotica*, states, “For Thom as for Peirce, an organism should be seen as an interpretant sign of its environment and vice versa, the environment as interpretation of the organism. ... Thom’s attraction for Sebeok can be partially explained by the fact that he [Thom] takes up the divine heritage of geometrizing nature.” (Baer, 1979: 353-4). On page 356 of the article, we find this comment: “The force of Thom’s geometrization of such elementary morphologies ... resides in its analogical applicability to various levels of morphogenesis from the growth of organisms to the growth of thoughts.” Further on, he writes, “Sebeok therefore envisages, under the umbrella of Thom’s theory, the outlining of a ‘biologically informed sign-science’ and a ‘semiotically sensitive life-science’.” (Baer, 1979: 364).

Laurent Mottron, a psychiatrist and cognitive scientist, writes, “René Thom’s semiotics is a huge domain in both complexity of its mathematical foundations and the deep philosophical problems it faces.” (Mottron, 1989: 92). Also on page 92, we find, “As with C. S. Peirce, Thom’s classification of signs and sign-processing must be included in a common list of categories because the classification itself has a universal value”. Further on, on page 94, Mottron writes, “For René Thom, the unit of a semiotic process is a domain of space, and not an abstract unit logically defined by its possession or lack of a particular characteristic. ... For him, there is always an element of spatial localization in a signification.” On page 98, we find, “Thom connects man’s semiotic function, or semiosis, to the effect of a configuration on animals, a set of behavioural and emotional reactions produced by the encounter with a biologically effective configuration.” Lastly, on page 105, we find, “Like Peirce, Thom does not suggest a psychological reductionism to explain the semiotic classification by its psychological conditions of possibility; rather he proposes a superordinate grouping by psychological processes according to their common constraints by the same dynamic structures. ...
Let us note, however, that Thom himself accepts a genetic determinism in the upper limit of complexity for semiotic operations.”

Horia Bratu, in the journal *Krisis*, writes, “In order to understand the aporias of catastrophe (discontinuity without destruction), only an artificial language-game can still create meaning. Metaphors, synecdoches, catachresis, and all the stylistic figures which offend common sense, are linguistic catastrophes, old rhetorical devices which are used by science in the interpretation of up-to-date experiments to make understandable strange phenomena from borderline regions of the universe.” (Bratu, 1989: 131-132)

Franson Manjali, a cognitive linguist, writes that since 1972, “Thom has relentlessly campaigned for the introduction of a new (non-) logic into the discipline of Linguistics. The semantics that stems from his subsequent writings has insisted upon mathematical topology and its base, in opposition to the logicist approaches belonging to the Fregean paradigm.” (Manjali, 1998: 1). On page 2, he writes, “The notion of meaning that Thom has developed, integrates its physical and cognitive aspects without setting up an exclusively linguistic level of meaning. This position is in stark contrast to the tradition of semantics started by G. Frege, where in the distinction between intra-linguistic meaning (‘Sense’) and extra-linguistic (‘Reference’) is of crucial importance. Also rejected is the traditional lexicalist view, ‘one word, one meaning’. ... Meaning is the domain of real physical/biological interactive occurrences that emerge as surface linguistic structures, via the archetypal morphologies.”

In (Manjali, 1993: 776-777), we find, “The notion of meaning that Thom has developed, integrates its physical and cognitive aspects without setting upon exclusively linguistic level of meaning. ... The ‘deep structure’ that Thom introduces, in opposition to that of Chomsky, is devoid of definite syntactic categories, as well as the latter’s combinatorial character. This is because Thom conceives the semantic structure as continuous forms, and not as discrete entities”.

The biologist J.P. Mazat, in reviewing a book dedicated to Thom’s work, writes, “Thom’s thought is eminently logical, and his short, provocative sentences are endowed with precise meanings that we tend to forget as we don’t always take them seriously. It is clear that René Thom exactly means what he says.” (Mazat, 1994: 93)

Finally, these thoughts of Robert Rosen [1934-1998], a Canadian theoretical biologist, place Thom in a wider perspective. In reviewing Thom’s first book [Thom 1975], Rosen wrote, “We can venture to predict that the Mechanistic Newtonian World view
which has dominated scientific thought for the past three centuries, is in the process of
being replaced by a new, organic world-view, ultimately forced on us by problems of
biology. This will result in a revolution in our science at least as profound as that
wrought by Galileo and Newton; of that revolution, works like that of Thom comprise
the vanguard”. (Rosen, 1977: 632)

§ 2. — Thom’s thoughts and aphorisms

Here are some of Thom’s thoughts that Mazat and others talked about.

“Thought is a kind of permanent orgasm.” (Thom, 1975: 313)

“I am convinced that language, this depository of ancestral knowledge in our species,
contains, in its structure the keys for the discovery of the universal structure of Being.”
[Thom quoted in (Wildgen, 2004, page v).]

“The more we understand each other, the more we discover new sources of
misunderstanding which lead to the emergence of new meanings.” [Thom quoted in
(Sourian, 2002: 14).]

“I think it is, more or less, philosophically an illusion to distinguish between reality and

“Ignorance is everywhere, and knowledge is a rare and precious form immersed within
the context of shapelessness and imprecision. ... Knowledge must be described as a
plant which grows slowly, attracted by light, pushing forth from a forgotten soil. The
growth of knowledge is local; it is almost always by a local mitosis from an existing
epistemic tissue that a new cell of knowledge appears.” (Thom, 1995: 1)

Some general thoughts of Thom on language and semiotics follow.

“It seems excessive to me to say (as does J. Kristeva?) that the arbitrary nature of
Saussure’s sign is due to the decision of the subject at play. If that were so, the very
origin of language would necessarily be attributed to play, for the major characteristic
of language is to have saved the ego from the alienation of suggestive forms by
transforming them into concepts endowed with signifiers. To the extent that man has
been able to give a name to an alienating form, he has freed himself from that
alienation. But the formation of man’s language has been brought about in a completely
unconscious manner by biological organogenesis. Conceptual thought has proliferated
as a parasite in the space of mental activity. Hence, for man, language is an instrument
which he does not control. To acquire a more perfect knowledge of this instrument, man must play with it. That is the origin of poetry.” (Thom, 1980: 38)

“A theory of analogy can be developed on a strict mathematical basis. From analogy to (poetical) metaphor, the way is long, yet these same new aspects involving dynamical analogies may help us to understand the meaning and origin of metaphors.” (Thom, 1994: 1)

“The sun, through its radiation, floods the Earth with its energy. This process is not at all semiotic. However, interpreted semiotically, it will be considered as a ‘gift’. This will lead many to respond to it with a counter-gift; hence the origin of the solar cults.” [Thom quoted in (Sourian, 2002: 10).] Jacques Sourian, a neuropsychologist, gives the above quote of Thom as a “very good example of the activity of the human narrative mind expressing the idea that a ‘narrative’ is not an effect of memory; on the contrary, human beings, because of their ‘narrative’ is not an effect of memory; on the contrary, human beings, because of their ‘narrative’ capacity are able to memorize what they lived and use this knowledge for understanding new situations.” (Sourian, 2002: 10)

“Why is language not axiomatisable? ... It is that, in everyday situations members of the same linguistic community have practically the same semantic universe, the same vision of the universe through their own language.” (Thom, 1972b: 203)

“However, the big problem—in the philosophy of language—is not that of truth .... but that of semantic acceptability, defining the world of what is possible, which contains the (eminently variable) subset of what is real. We will not be looking for the foundation of geometry in logic. On the contrary, we shall be seeing logic as a derived activity (a secondary one, when all is said and done, in the history of the human mind), a rhetoric. We shall be trying, not so much to convince, as to suggest representations and to extend the intelligibility of our world. Instead of building geometry in a logical manner, we shall seek to base what is logical on geometry.” (Thom, 1990: 2)

“I wanted to describe here something that might be called ‘protophysics’, source and reservoir of all permanent intuition of all those archetypal metaphors that have nourished man’s imagination over the ages.” (Thom, 1990: 3)

“Any object in three-dimensional space has an infinity of apparent contours and neither DNA nor any other chemical support contained in the egg would hold enough information to code them all. Whence the necessity of invoking cultural transmission, linked with the social or family organization of the community.” (Thom, 1990: 11)

“The problem of meaning has returned to the forefront of philosophical inquiry. ... There is pressure to establish under the name of Semantics, or of Semiology, as an autonomous discipline, a general theory of meaning, and of the correspondence ‘signified-signifier’ common to any system of communication. But up to the present
[1971], this effort has been confined to the so-called ‘human’ sciences. The ‘pure’ scientists, physicists, biologists, and even linguists of formalist inclinations, seem to steer clear of such attempts which, in their eyes, are clouded by a suspect subjectivism. Will the notion of meaning remain inaccessible to objective analysis?” (Thom, 1983: 166-167) [For more on the notion of meaning, see (Petitot, 2004).]

“Is not such a discipline [semiotics] which tries to specify the connection between a global dynamic situation, (the ‘signified’) and the local morphology in which it appears (the ‘signifier’), precisely a ‘semiology’? ... We aim to create [1971] a theory of meaning whose nature is such that the act of knowing is a consequence of the theory.” (Thom, 1983: 169-170)

“In human (or animal) symbolism, a message is formally different from its tenor or its meaning. It can provoke in the recipient complex and subtle behaviour.” (Thom, 1983: 225, written in 1972)

“In the theory of language, the possibility of ambiguity is a permanent factor of change.” (Thom, 1983: 235, written in 1972)

“If language has been substituted for imitation, we should note that the latter continues to play an important role in our societies at pre-verbal levels (cf. fashion). In addition, imitation certainly plays a primary part in the language learning of a child of 1 to 3 years.” (Thom, 1983: 236, written in 1972)

“Every theory of verbal production (psycholinguistic) necessarily raises the philosophical problem of knowing whether a pre-verbal thought exists of which language would be only the external manifestation. If it is unquestionable that our thought occurs most often as an interior monologue, that is, in effect, repressed talk, it no less remains true that ways of nonverbal thought exist in man which he shares with animals. Amongst these primary activities, the sensory representation of the world about us is fundamental. In my opinion, it is from this that the fundamental mechanisms of language arise.” (Thom, 1983: 238-239, written in 1972)

“The appearance of language in primitive man is perhaps not the abrupt discontinuity we are so eager to imagine. There is indeed a great change in the passage from animal into man; but as we shall try to show ..., this change is probably due less to a catastrophic structural innovation in the cerebral organization than to a modification in the stages of individual development, associated with the presence of a social milieu which at the same time protects and educates the newly-born.” (Thom, 1983: 261, written 1973)

“Any discussion of symbolism must start with the classification of signs, so simple and so profound, which has been left to us by Charles Sanders Peirce. Let us recall that, according to Peirce, there are three types of signs: (1) images or icons ... (2) indices ...
(3) symbols... Philosophs have a tendency to look upon the first category of signs, the icons, as a banal nature and of little interest for the theory of symbolism. It is reasonable to believe that they are wrong and that a delicate analysis of the dynamic process involved in the production of the images (the ‘copy’) poses problems of a fundamental nature which are at the very heart of the relation: signified↔signifier, which characterizes the symbol in its complete form.” (Thom, 1983: 261-262, written in 1973)

“It is through the subtle balance between two morphologies, through the simultaneous demands of reversibility and irreversibility, that the dynamic of symbolism carries within itself (and this in a local and concentrated form) all the contradictions of the scientific vision of the world. And this is the very image of life.” (Thom, 1983: 264, written 1973)

“The truth is that the form of a sign cannot (at least historically) be dissociated from its motivation... the signifying characteristic of a form is always liked to its morphological instability, a fact which allows it by transmission, to generate, by unfolding, a complex of more simple forms.” (Thom, 1983: 265, written 1973)

“... the source of symbolism is to be found in the complex mechanisms of the regulation of living organisms and of society.” (Thom, 1983: 266, written in 1973)

“It must not be forgotten that above all signs (icons, indices, symbols) are forms in space-time, and that consequently their spatio-temporal localization is one of the first factors to consider. ... In order that the effect of a sign is realized, its localization must be ‘reasonable’, ... What would be the use of a ‘STOP’ sign in the middle of a field of beetroot?” (Thom, 1983: 270-272, written in 1973)

“Only those who know to listen to the response of Mother Nature will come later to open a dialogue with her and to master a new language. The others will babble and buzz in the void, bombinans in vocua. And where, you may ask, will the mathematician be able to hear Nature’s response? THE VOICE OF REALITY IS IN THE SIGNIFICANCE OF THE SYMBOL.” (Thom, 1983: 276, written 1973, the emphasis is mine.)

[A recent book, (Wildgen, W. and Brandt, Per Aage (eds.), 2010) has more on Thom’s semiotic heritage.]

[The recent translations of Thom’s conversational books (Thom 2014) and (Thom 2015), have more on his philosophy in the areas of semiotics and linguistics.]

[For more on Mathematics and Semiotics, see (Thom 1986) or (Thom 2017).]
§ 3. — Concluding Thoughts

These final thoughts of Thom bring out the depth of the man’s philosophical and practical domains.

“Geometry is a natural and possibly irreplaceable intermediary between ordinary language and mathematical formalism, where each object is reduced to a symbol and the group of equivalences is reduced to the identity of the written symbol itself. From this point of view, the state of geometric thought may be a stage that is impossible to omit, in the normal development of man’s rational activity. ... There is hardly any doubt that, from a psychological, and for me, ontological point of view, the geometric continuum is the primordial entity. If one has any consciousness at all, it is consciousness of time and space; geometric continuity is in some way inseparably bound to conscious thought.” (Thom, 1971: 696)

“I will add, with customary philosophical solicitude, that our model [of morphogenesis] offers interesting perspectives on mental processes and on the mechanisms of knowing itself. In effect, from this point of view, our psychic life is none other than a sequence of catastrophes [discontinuities, critical points above an attractor is destroyed or bifurcates] between attractors of the dynamic constituted by the stationary activities of our neurons. The intrinsic dynamic of our thought is not then fundamentally different from the dynamic acting on the outside world. We can say that the modelled structures of exterior forces can, by coupling, be constituted in the very interior of our mind; this is precisely the act of knowing.” (Thom, 1983: 22, written in 1968)

“It is legitimate to assert, and this in spite of philosophers who never cease to pronounce on the error of our senses or the ‘deformation’ that our senses bring to reality (?!), that the essential function of the sensory apparatus (in animal or man) is to furnish a faithful copy as possible (even metrically) of the universe that surrounds him. It is this constantly present copy which constitutes the ‘conscience’, the subjectivity of the individual.” (Thom, 1983: 224-225, written in 1972)

“Here an essential point comes to light: the symbolic function has a regulatory value for the stability of our biological being. ... Life is constantly threatened—on the one hand by the violence of natural forces, the blind unleashing of chthonic [those of the underworld] energies and on the other by sleep, annihilation, the stability of nothingness. Excessive meaning, mixing Truth and Falsity, is a response to excessive peril; to the eternity of emptiness corresponds sleep, senseless and droning repetition, the stocking of inert information.” (Thom, 1989: 403)

“By allowing the construction of mental structures and forces of the outside world, as well as the structure of the mind itself, mathematical activity has its place in the warp of evolution. This is significant play *par excellence* by which man can deliver himself
from the biological bondage that weighs down his thought and language, and can assure the best chance for the survival of mankind.” (Thom, 1975: 317-318, written in 1968)

“A mathematician cannot enter on subjects so far removed from his usual preoccupations without some bad conscience. Many of my assertions depend on pure speculation and may be treated as day-dreams, and I accept this qualification—is not day-dream the virtual catastrophe in which knowledge is initiated? At a time when so many scholars in the world are calculating, is it not desirable that some, who can, dream? (Thom, 1975: 325, written in 1968)

References

A. Sebeok and J. Umiker-Sebeok (eds.) (Berlin: Mouton Gruyter)


_________ (1994). Can Mathematics Fully Describe Reality?-An Evaluation, in *Œuvres complètes de René Thom 2003*, M. Porte (ed.) (Bures-sur-Yvette: I.H.E.S.) This article can also be found in (Thom 2017, pp. 237-248). Thom also used the title “The task of mathematics in describing the world”.


[_________ (2014). *Parables, Parabolas and Catastrophes*, translated from the French by Roy Lisker (Toronto: Thombooks Press)]

[_________ (2015). *To Predict is NOT to Explain*, translated from the French by Roy Lisker (Toronto: Thombooks Press)]


[Wildgen, W. and P.A. Brandt (eds.). *Semiosis and Catastrophes: René Thom’s Semiotic Heritage*, (Berlin: Peter Lang)]

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