

Review article

World modeling*

Julio C. Jeha

Common to most definitions of science fiction is the necessity of a world where scientific knowledge has progressed beyond the episteme prevailing in the author's world. This gap between science fiction worlds and the author's world arises from 'a fictional novum (novelty, innovation)' (Suvin 1979: 7) that generates a 'representational discontinuity' (Scholes 1975: 62). The creation of such worlds is what Carl D. Malmgren investigates in his *Worlds Apart*.

Malmgren describes worlds as being composed of actants who exist in certain topoi. Worlds of science fiction come about as a 'thought experiment' (LeGuin 1976) that answer the question 'what if' or the hypothesis 'if this goes on' (Malmgren 1991: 8, 12). Thus, science fiction authors speculate about or extrapolate from our experience of a world that obeys natural laws to build their fictional planets.

Experience occupies the focus of any study investigating the modeling of reality to create a world. Questions such as, 'How do we experience our world,' 'Do all organisms experience it in a like manner,' 'What role, if any, does perception play in the way we perceive the environment' must be addressed if we want to understand the process of 'terra forming.' Eventually, this investigation will lead to the related points of mimesis and poiesis—the convergence to and the divergence from 'reality'—in our representational processes.

* Carl D. Malmgren, *Worlds Apart: Narratology of Science Fiction*. Bloomington: Indiana University Press, 1991.

The construction of experience

We can understand experience as the difference between the physical environment and the beings for which the environment exists intentionally. The environment acquires an intentional existence when those beings reconstitute it to form an objective world of experience. Or if you like, experience exists for those beings that interpret the environment, that are queried by it and answer it, transforming it and being transformed by it, in a dialogical and cybernetic interaction. This interaction yet involves more factors than are present in the physical surroundings: emotions, illusions, and abstractions.

The organism finds itself in the centre of a web of relations through which it can know both itself and the environment. Cognition happens by certain relations that arise through the action of signs in nature. The proper name for this action is semiosis: the action by which one thing stands for another in a net of representations. In such a semiotic net, or web, organism and environment cease merely to exist and interact by further becoming objects of experience. These objects, together with the relations that constitute and sustain them, are experience itself.

The fabric of the semiotic web is intrinsically labile, for each new experience implies a new thread, a new relation, a new design. This possibility of continual alterations prevents us from drawing a permanent and rigid division between what is mind-dependent and mind-independent. The mind-dependent being exists only as a product of cognition and the mind-independent exists by itself, independently of the organism. The point here is that all the elements of cognition are equally objective. It does not matter whether their origin is a subject existing in nature or the cognizing organism itself as a kind of natural subject.

Here as elsewhere I adopt a semiotic version of the scholastic use of *esse subjectivum* and *esse objectivum* (Jeha 1993: 350). Subjective means that which exists in itself or outside the mind, and objective that which exists for the mind on the basis of representations. Object, in this perspective, is the terminus of the relations that obtain from the cognizing operation. Thing, for

Peirce and the scholastics before him, is everything that is there for the mind to meet. When a thing is known, it becomes an object.

For experience to exist, the organism must be able to reconstitute the physical environment through objective associations that may not exist apart from the reconstitution. The experiencing organism superimposes onto its environment an ‘interpretation.’ This interpretation is a system that allows it to model the physical world to the biological necessities of the modeling subject as a member of a species. For the animals of the *Homo sapiens* species, this modeling goes beyond attending to survival necessities into the creation of sophisticated constructs such as language and, later, culture.

Objective worlds

Experience as a construct common to all forms of animal life is a biological notion that was better developed (for semiotic understanding) by Jacob von Uexküll. He called this construct *Umwelt*, which corresponds to the notion of objective world (in contrast with physical environment).

According to Uexküll (1957), stimuli appear in the *Umwelt* as elementary sensations, to which correspond elementary reactions. To every group of external stimuli that reach the subject in the form of questions corresponds a group of actions that are the subject’s answers to the world. Uexküll argues that the subject organizes perceptions by projecting them to constitute things as objects meaningful for the knowing subject.

Every organism lives in an objective world, which determines it and which is determined by it. All the perceptions of the organism, considered from within that ‘bubble,’ constitute the experienced reality. Unless the organism is capable of placing itself in a point of view exterior to its *Umwelt*, its objective world is equivalent to reality. Thus, only partially does its *Umwelt* coincide with the world independent of its cognition.

For the animals, this equivalence creates the possibility of delusion and camouflage, upon which they depend to find food and to survive their predators. For the human animals, the difference between mind-dependent and mind-independent beings provides the possibility to introduce in experience an entirely new dimension for each experienced object: the dimension of 'stipulability'. From 'stipulability' arises all the world of culture in its difference from a mere society as a phenomenon common to most higher forms of life.

In zöosemiosis the action of signs is apprehended by the animals that make use of signification to interact with the environment and to survive there. At that level semiosis is the construction of a structure of experience through relations of signification based on *entia realia* or on *entia rationis*, or on both. Here the purpose of the *entia rationis* is to bring into the biologic range of the organism those aspects and elements of the physical environment that it needs to survive.

In anthroposemiosis we speak of a semiosis that was and is modified by the awareness and by the manipulation of the role that the relations implied in the sign perform in the structuring of experience. Once the human being is aware of relations as being also an element of objectivity, he adds to the sign the characteristic of 'stipulability'. This characteristic makes possible the existence of language and, consequently, the objective world specific of human beings, the *Lebenswelt*.

In the *Lebenswelt* the objective world opens itself to levels of development that have no precedents nor were prefigured in the *Umwelt*. An opening according to its contrast with the intentional autonomy of the *Umwelt* makes possible the human sciences and literature. An opening according to its contrast with the preadjacent physical environment makes possible the natural sciences and technology.

Animals are also capable of playing with the objects within their *Umwelt* and reorganize them objectively in new ways. When this happens, however, what occupies the consciousness of the animal are the objects related, not the relations between them. In zöosemiosis the organism

doesn't know that it is manipulating a connection. In anthroposemiosis the knowledge of this possibility of altering fundamentals and termini makes this capacity attractive to the human being.

For animals, it would be more appropriate to speak of correlations between the objects of the senses, while for the human beings we must speak of ideas. By idea I mean the awareness of relations of signification detachable from their bases that enable the human beings to recreate the structure of experience. The idea marks the passage of the human being from the level of the *Umwelt* to the level of the *Lebenswelt* as it serves him as a tool for the introduction of relations that do not exist in the animal *Umwelt* nor in the physical environment. The animal *Umwelt*, we must keep in mind, is an objective world of purely perceptual elements where relations remain objectively latent or merely virtual as objects of experience.

Having seen what happens in the biological (human and non-human) and in the cultural (specifically human) objective worlds, let us turn our attention to the inner world of the individual. Uexküll (1909) called it the *Innenwelt*. This is the interior map that the individual builds and uses to orient itself in the objective world of its species. Such a map comprehends the set of structures and bodily functions (Lorenz 1971: 275) that will orient the behavior of the organism in the *Umwelt*.

Peirce recognizes the existence of this interior world and its relation with the exterior world. 'Every person,' according to him (*CP* 5.487), 'lives in a double world, the inner and the outer world, the world of percepts and the world of fancies.' By percepts let us understand the objects directly apprehended. These objects are the elements that are part of the *Umwelt* and have their correlative in the *Innenwelt* of the experiencing organism.

Human beings can be affected by their percepts and their fancies to produce 'a tendency—the *habit*—actually to behave in a similar way under similar circumstances in the future' (*CP* 5.487). Reiterations in the *Innenwelt*, as well as in the *Umwelt*, produce habits that can influence actual behavior in the *Umwelt*. Thus, the inner world can use signs of fancy to create an outer world composed of mind-dependent beings: an objective reality without a counterpart in the physical

environment. In a similar way, through logical signs, the *Innenwelt* can create an *Umwelt* capable of taking the place of an objective reality, up to a certain point, freely chosen.

Modeling systems as interpretants

Sebeok believes that it was from Uexküll's theory that a whole application of the term 'modeling system' was developed in semiotics, mainly owing to the studies of the Tartu-Moscow group. In a first attempt to clarify the meaning of that concept, Sebeok (1987: 22) remarks that 'there is a very simple English word [for *Umwelt*], it's "model".' Thus, the 'interpretation' an organism makes of the environment to create its species-specific objective world—the *Umwelt*—is already an act of modeling.

Taking Uexküll's notion as a point of depart, it is possible to find three main modeling systems. The first is the species-specific biological apparatus, which creates the *Umwelt*. The second is the individual organism's interests, which determines its cognitive map—the *Innenwelt*. The third is human-specific: language, which allows for the rise of the world of culture—the *Lebenswelt*.

Sebeok (1981: 120) has called language a 'behavioral organ'; Chomsky (1980: 60, 241) calls it a 'mental organ.' Both see language as endowed with a function: that of modeling the universe. For Sebeok (1987 n.2), language as a

modeling system, in the broad sense, refers to an ideological relationship with some other system, such as an individual organism, a collectivity, a computer, or the like, and where its reflection functions as a control of this system's total mode of communication. A model of the world thus constitutes a program for the behavior of the individual, the collectivity, the machine, etc., since it defines its choice of operations, as well as the rules and motivations underlying them.

The introduction of language in the human *Umwelt* produced a model of the world that queries the human beings and to which they answer, transforming it and being transformed by it.

Language operates also between the *Innenwelt* and the *Umwelt* of the individual. When he communicates, the individual correlates his *Innenwelt* and his *Umwelt*. He makes his internal modeling system (purely objective) commensurate with the modeling system (objective and physical) in which he exists. To do so, he must resort to a correlation that is also a modeling system, as we shall see.

Suppose two individuals from different cultures who want to communicate about a certain object. The communication will be deficient because of the degree of incommensurability that exists between the interpretants they develop about that object. Some communication always occurs, though, since their objective worlds superimpose in certain common points that make possible the exchange of messages. The common points we call *code*; the private, *ideas*.

The code exists primarily in the *Umwelt* in a form previous to the linguistic form: it marks the physical environment according to the objectivity of the organism interacting with it. The code corresponds, biologically, to an anomaly in the *Innenwelt* that Uexküll called 'familiar path:' the organism recognizes within the *Umwelt* a path that depends on its experience. There is nothing in the physical environment that determines the sequence of steps that the organism must take to go from one place to another.

In a certain manner, the familiar path is a modeling subsystem, both in zoösemiosis and in anthroposemiosis. As a code, the familiar path is an interpretant not only for the human being but for the whole nature: where there is correlation, thirdness, or laws, there is an interpretant.

We can consider the familiar path, strictly biological and functioning only at the level of perception (and even before it), as a prefiguration of the code properly speaking, that is, linguistic. Idea (discovery of the relation) and code (correlation) are interpretants, linked to *Innenwelt* and *Lebenswelt*. The two individuals from different cultures have their own interpretants about the object they want to talk about. Although the interpretants originate in their interior objective worlds, they can be communicated through stipulated signs that are part of their external objective worlds.

The code must be shared between emitter and receiver for communication to occur. Peirce (qtd. in Hardwick 1977: 196-197) calls it ‘communicational interpretant’:

a determination of that mind into which the minds of utterer and interpreter have to be fused in order that any communication should take place. This mind may be called the *commens*. It consists of all that is, and must be, well understood between utterer and interpreter at the outset, in order that the sign in question should fulfill its function.

The communicational interpretant is more than the linguistic code: it is all that objective universe to which reference is made.

‘Real’ and ‘reality’ are thus the interpretants of real and reality developed by a culture and by the individual at a certain time. Similarly, the interpretant of good or bad is constructed by a culture or by an individual, and are therefore historically dated. The interpretant substitutes for the traditional (pre-semiotic) notion of natural given: reality, good, and bad are collective interpretants constructed by human beings in the *Lebenswelt*.

When we interact with the world, we impose our biological, individual, and cultural interpretation upon it. Experience is not a relation that obtains between an organism and the environment, but a semiotic process in which the environment becomes a sign to an organism according to its species-specific and individual interpretants. Human beings add another dimension to the process—that of culture.

Regardless of how much we try to depart from our interpretation of the world in an attempt to create something totally alien, we will inevitable fail. Our capability to create worlds is conditioned by a preajacent biological interpretant, the *Umwelt*, to which we must add a cultural modeling system, the *Lebenswelt*.

The worlds of science fiction

World making in science fiction obeys the rules of modeling prevalent in the *Lebenswelt*—a world radically different from ours is unimaginable, for the absolutely new is uncognizable. The nature of things, Peirce (*CP* 8.314) says, prevents us from knowing the dynamical object of a sign. A sign only indicates its dynamical object and leaves the interpreter to find it out by collateral experience. Any science fictional world must bear relations with the actual world of the reader and, thus, follow the same rules of world making.

Malmgren recognizes this cognitive requisite and claims that what defines a science fictional topos is a disjunction between the empirical and the textual worlds (p. 10). This disjunction, owing to the ontological status of the genre, must be based on science.

Here lies the difference between fantastic literature and science fiction. The fantastic event, according to Bessière (1974: 32), lacks any internal possibility—

it becomes fantastic by the superposition of two external probabilities: one, rational and empirical (physical law, dream, delirium, optical illusion), which corresponds to the realistic motivation; the other, rational and metaempirical (mythology, theology of miracles and of prodigies, etc), which transposes the unreality to the supernatural level, and which, for this reason, makes it conceivable if not acceptable.

By contrast, what characterizes science fiction, as Malmgren claims (p. 10), is ‘a fictional world whose system of actants and topoi contains at least one factor of estrangement from the basic narrative world of the author, and by a discourse which naturalizes that factor by rooting it in a scientific episteme.’ Both science fiction and the fantastic share an estrangement from the author’s world (Doležal’s ‘basic world’), but while the former relies on a scientific novum, the latter resorts to breaching a natural law.

The science fiction reader is expected to recognize the gap between natural and fictional world and to bridge it by recovering the alien *Lebenswelt* the author has created. Such a recovering, says Malmgren, is specific to science fiction, because it involves ‘a trial-and-error

process of hypothesis, confirmation, and/or disconfirmation, a process that has its roots in the scientific method' (p. 24).

It is not so.

Every reading functions like that, be it of fictional or non-fictional texts. Moreover, cognitive theories (for instance, Damasio and Damasio 1992, Kandel and Hawkins 1992, Kawano 1992, Gardner 1985, Mayer 1983) tell us that is how learning in general occurs. The reading of science fiction does not have 'its roots in the scientific method;' rather, it is the scientific method that mimics our ways of world making. What is a scientific theory if not a model used to explain the world?

Malmgren divides the processes of science fiction world making into extrapolation and speculation. Speculation, which answers the question 'what if', is a clear case of abduction. It requires a 'quantum leap of the imagination', in his words (p. 12), 'toward an entirely *other* state of affairs.' Extrapolation, which works out the hypothesis 'if this goes on', illustrates the intellectual process of deduction—'is basically a logical and linear process.' Abduction, deduction, and induction, as every Peircean knows, are the logical processes by which we go about learning and living.

Chapter III of Malmgren's *Worlds Apart* succeeds in laying out a flawless typology of science fiction worlds. He combines extrapolation and speculation with the four major science fiction types to obtain a classificatory grid that covers most of that literary ground. Granted, his classification is immaculate, but like most, it leaves an aftertaste of 'So what?'

More interesting—and closer to a semiotic approach—are his comments on the necessary anthropocentric stand authors take to create science fictional worlds. As he analyzes a frequent complaint 'that whatever form the alien Other might take, it is never really "alien"' (p. 57), Malmgren raises the semiotic argument that 'absolute Otherness is an artistic impossibility; that which is completely Other would be also completely incomprehensible to the reader, who is necessarily locked into an anthropocentric framework to an extent'. Because our cognitive processes work by contrast and comparison, there must be something familiar in every

phenomenon so it can be knowable (which leads to a related point—mimesis—that I will develop later).

When Malmgren investigates science fantasy (Chapter IV), his book contributes to redress a critical abuse. A much vilified literary kind, science fantasy belongs in the twilight zone between the supernatural and the superscientific. For that reason, theoreticians tend to consider it either a bastard form of science fiction, or fantasy with pretensions to ‘seriousness’. Malmgren evaluates it for what it is worth: science fantasy deconstructs both fantasy and science fiction to reconstruct a new ‘genre’ (p. 157):

It explores the epistemological assumptions of SF by interrogating ‘science’ in its broadest sense, i.e., systematic and methodical ways of apprehending, comprehending, and appropriating the physical world. It plays on the ontological assumptions of fantasy by calling into question the impossibility and unreality of the spectral horrors and beautiful desires that haunt the value-laden worlds of our dreams.

This sums up science fantasy precisely and reveals its qualities as an interstitial locus from where to throw a new light on both its unwilling parents.

Towards a semiotic concept of mimesis

As Davis (1985) has shown, in Plato’s theory of mimesis the sign relation that obtains is indexical, for it points to a supposed essence of the object. In Aristotle’s theory, the relation is iconic, for it is based on the character the sign has that refers to its object. We can say that the Platonic mimesis is essentialist, for it indicates the imitation of ideal forms, and the Aristotelian is ‘structuralist’, that is, it refers to the imitation of the structural relation among those forms. In the Aristotelian structuralism, however, there is a residue of Platonic essentialism: ‘meaning for Aristotle is inherent within (iconic) structure and effectively made “substantial” within narrative modeling—contained as an essence within and a positive reference to pattern itself’ (Davis 1985: 51). Semiotic theory shows that in mimesis the iconic relation is referential and specular;

however, iconicity operates like an algebraic function where the variables stand for any values attributed to them. In this way, the subject of mimesis—the *mimos*—is nothing in itself, possesses no qualities and, therefore, lends itself to any role—it is just an operator.

The nature of semiosis makes it possible to every sign—and that is what almost always happens—to become the object of another sign. This process unfolds in two directions: toward the final sign and toward the initial object, but never reaching either. Semiosis tends to infinity, and the action of the signs is always the signification of another sign—of another signification. In a similar way, and because of that, what occurs in mimesis is always the imitation of an imitation. Thus, semiotics settles the controversy between idealist (essentialist) mimesis and realist (structuralist) mimesis and welds them in a whole bigger than the parts. Mimesis, according to semiotic theory, refers to an object, and that object is imitation itself; or, conversely—and with the same result—mimesis refers to the imitation of an action, and that action is imitation itself.

Let's suppose a triangle SIO, where S = sign, I = interpretant, and O = object. The angle \hat{I} tends to $0E$ in realist representation and to $180E$ where fantasy (poiesis) predominates. What prevents S and O from conflating completely ($\hat{I} = 0E$) is poiesis, and that which prevents a total opposition between S and O ($\hat{I} = 180E$) is mimesis.

Realist representational processes work trying to anchor representation in the *Lebenswelt*, while where fantasy predominates, mimesis becomes the representation of the world modeling process. In the former, the sign almost mistakes itself for the object, which occupies the *mimos* almost entirely. In the latter, the interpretant achieves a maximum value for the sign and orients the semiotic operation.

A true semiotic mimesis is that of interpretant, non-specular and non-figurative. This notion is pivotal to the thesis that poiesis and mimesis are antagonistic twins that complement each other in that uniquely human characteristic: the capability to, based on something known, manipulate relations to create possible and impossible worlds.

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