

## **The World from Within — Endo & Nano Over and Beyond the Limits of Reality Peter Weibel**

This year's Ars Electronica will focus on two new radical transformations of our world image and the new image worlds accompanying it: endophysics and nanotechnology.

The electronic world with its model worlds and computer simulations, interface and virtual realities gives us reason to believe that the world can now be understood in terms of an interface. Endophysics and nanotechnology are two different ways to study the phenomenon of interface in greater detail than was possible up to now — on the one hand on a much smaller scale (nano: very small) and on the other from within (endo). In his book "Engines of Creation, The Coming Era of Nanotechnology" (1986), K. Eric Drexler introduced molecular "machine technology" by means of which matter is arranged around the atoms. Molecular nanomachines (enzymes, hormones, and viruses can be described as machines) give us access to the microspheres of nanometric dimensions (nanometer is the billionth of a meter). By means of direct, precise manipulation, identification and block formation of individual atoms and molecules made possible by Feynman machines à la grid tunnel microscope, we are able to approach the central switching station and mixer of nature. From medicine to the exploration of material qualities or the discovery of new materials we are confronted with a radical transformation of our material existence. Electronic nanocomputers, possibly a hundred thousand times faster than electronic microcomputers, will accelerate this development.

Endophysics is a science that explores what a system looks like, when the observer becomes part of this system. Is there another perspective than that of the observer? Are we only inhabitants of the inner side of the interface? What does classical objectivity mean then?

Endophysics shows to what extent objective reality is necessarily dependent on the observer. Ever since perspective was introduced in the Renaissance and group theory in the 19th century, the phenomena of the world are known to be contingent on the regular localization of the observer (co-distortion). Only outside of a complex universe is it possible to give a full description of it (cf. Gödel). For endophysics this position is only possible as a model, outside of a complex universe -not within reality itself. In this sense, endophysics offers an approach to a general model and simulation theory (as well as to "virtual realities" of the computer age). Endophysics developed from chaos theory, to which Otto Rössler has contributed since 1975 (see the famous Rössler-Attractor, 1976). Another aspect of endophysics is the reinterpretations of issues related to quantum physics. Rössler provides a synthesis of Everett's, Bell's and Deutsch's interpretations of quantum physics with Nelson's stochastic mechanics.

Endophysics differs from exophysics, since the physical laws that are valid when what is part of what one is observing are generally different from what is true from an imagined or real external point of view. Gödel's non-distinction is also only valid internally — within the system.

An explicit observer has to be introduced into the model world of physics in order to make the reality existing for him accessible. Endophysics provides a "double approach" to the world. Apart from the direct access to the real world (by way of the interface of the senses) a second observation position is opened from an imaginary observer position. Is the so-called objective reality only the endo side of an exo world?

The history of cultural production has time and again provided evidence that man senses the possibility of the world being only the endo side of an exo world. It is revealed in many visions, gnostic formulations, riddles and paradoxes. In order to illustrate the phenomenon of the interface as the only reality, we can have recourse to the model of the "bubble boy" who lives in a sterile bubble and only communicates with the world via the interface. The menu of his world program is on the keyboard inside the bubble. Whereas our macroscopic world is irreversible, the bubble in which we find ourselves is microscopically reversible with contra intuitive consequences.

The fact that our world is not classic does not necessarily speak against what was said above. The classical time inversion invariance and the classical permutation invariance by means of equal particles result in "non-classical", nonlocal phenomena. The "rest of the world" becomes distorted for the internal observer so that he / she cannot correct or recognize it. The world is made of rubber, only we do not notice this because we, too, are made of rubber. The resulting hypersurface of simultaneity have a complex curvature from the viewpoint of the external observer. The latter feels tempted to give the internal observer "leads" which let him / her peek behind the curtain. Unfortunately we do not possess a similarly "large eye" in our world to which we could turn to for help. That is unless we try to construct a fictive, omnipotent and omniscient super-observer.

The only scientific way of figuring out whether our world has a second exo-objective side is to construct model worlds (or artificial worlds) on a level below our world. This approach is called endophysics. The world as a "repair shop for a machine of desire" could be the next step.

The endo approach has great promise for the complex techno-world of the electronic age. The implications of the industrial (machine-based) and post-industrial (information-based) culture — mechanization, new media, simulation, synthetization, semiosis, artificial reality, deprivation of being, etc., are integrated into a new discourse. This approach provides a new theoretical framework for describing and understanding the scientific, technical and social conditions of the post-modern world. The virtual worlds are, for instance, a special case of endophysics. The issues that endophysics addresses from observer-relativity, representation and nonlocality to the world seen as being merely an interface — are central issues of an electronic and telematic civilization. The observer-reality and contingency of the manifestations of the world revealed to us by endophysics, the difference of observer-internal and observer-external phenomena provide valuable forms of discourse for the aesthetics of self-reference (the world of image signals), virtuality (of the immaterial character of picture sequences) and the interactivity (of the observer relativity of the image) as we see them defined by electronic art.

The endo approach to electronics (from the exhibition "The Intrinsic World of the Machine World" to interactive computer installations in real-time) implies that the possibility of experiencing the relativity of the observer dependent on an interface and that the world can be described as an interface from the perspective of an explicit internal observer. For isn't electronic art a world of the internal observer par excellence by virtue of its participatory, interactive, observer-centered and virtual nature? This leap from one external and dominant viewpoint to an internal participatory viewpoint also determines the nature of electronic art. Electronic art moves art from its object-centered stage to a context and observer-oriented one. In this way it becomes a motor of change, from modernity to postmodernity, i.e., the transition from closed, decision-defined and complete systems to open, non-defined and incomplete ones, from the world of necessity to a world of observer-driven variables, from

monoperspective to multiple perspective, from monoculture to multiculture, from monopoly to pluralism, from text to context, from locality to non-locality, from local to remote correlation, from totality to particularity, from objectivity to observer relativity, from autonomy to covariance, from the dictatorship of subjectivity to the world of the machine.

We propose the introduction of two levels: first the endo approach to electronics and second electronics as the endo approach to the world. The nature of electronic art can only be understood as an endophysical principle since electronics itself is an endo approach to the world. The construction of model worlds on a lower level as a real world with an explicit internal observer-like the closed circuit installations, where the observer sees him / herself in the observation devices, the feedback situations where the machine watches itself, or virtual reality where the hand of the external observer is simulated as part of the internal observer is in the image, is in keeping with the principle of endophysics. The description of the world in terms of interface and the acknowledgement of the non-objective, only observer-objective nature of objects are corollaries of the endophysical theorem. The world interpreted as observer-relative and as interface is the doctrine of electronics interpreted as endophysics. The world changes as our measuring chains (observation), our interface change. The boundaries of the world are the boundaries of our interface. We do not interact with the world — only with the interface to the world. This is something else that the endo approach to electronics teaches us. The electronic art to be presented at the 1992 Ars Electronica in exhibitions and performances should help us to better understand the nature of electronic culture and the foundations of our electronic world.

Through electronic art we tend more and more to see the world from within. In the age of electronics the world is becoming increasingly manipulatable as an interface between observer and objects. Electronic technology has led to the insight that we are only part of the system or an inner inhabitant of the system that we observe or with which we interact. For the first time we also have access to a technology and theory in which the world is imposed on us as an interface only visible from within.

We are now also able to observe the system and the interface from the outside and conceive of the interface as being extended in nanometric and endophysical terms. In this sense we are able to break out of the prison of space and time (the Cartesian coordinates), described by Descartes for the first time in detail. The grid of here and now becomes more malleable. Virtual reality, interactive computer installations, endophysics, nanotechnology, etc., are technologies of the extended now, of the non-local here, (remotely correlated) ways of transcending the local event horizon. All of this represents a technology that frees us from the letters of reality.