

Endophysics, The World as an Interface: Otto E. Rössler,
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Preface (1998)

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In this book a new science, endophysics, is brought to the reader's attention. Following relativity, quantum mechanics and chaos theory, for the fourth time in a century a radical questioning of the understanding of reality takes place. Relativity has suspended the absoluteness of space and yet, at the same time, subjected all phenomena to the velocity of light as an ultimate absolute constant. Quantum mechanics, by introducing the observer, has relativized the objective character of the world. Chaos theory amplified the unavoidable error of measurement and has thereby rendered the unpredictability of the future an inescapable fact. After the "relativization" of objectivity through an absolute speed limit, observation and unpredictability, endophysics brings the chain to its logical end by replacing the traditional assumption of the external observer (exophysics) with the introduction of the internal observer. This internal perspective differs from the quantum-physical problem of an observer dependence in that the measurement problem is in quantum mechanics still believed to be objective (and in reality to be objectively capricious), while in endophysics the internal observer is constitutive in an exact sense. The relativization and observer dependence of the world thereby becomes considerably more radical. Chaos theory, too, still presupposes a (prequantum) external observer. Whereas in chaos theory the unpredictability follows from the error explosion, the loss of attainable knowledge in endophysics is not error-induced but structural.

Endophysics shows us to what extent objective reality is necessarily dependent on the observer. Ever since the introduction of perspective during the Renaissance and of group theory in the 19th century, we have known that the appearances of the world depend in a lawful manner on the localization of the observer ("codistortion"). Only if one is completely outside a complex universe is a complete description of the latter possible (cf. Gödel). According to endophysics, it is only in a model that this position on the outside of a complex universe is possible, but *not* in reality itself. Endophysics hence provides an approach to a general model and simulation theory (and also to the "virtual realities" of the computer age). It is an outgrowth of chaos theory, to which Otto Rössler has contributed since 1975 (cf. the celebrated Rössler

attractor, 1976). Another aspect of endophysics lies in the production of novel interpretations of quantum-physical problems. Rössler builds a bridge between the quantum-physical interpretations of Everett, Bell and Deutsch on the one hand and the fractal mechanics of Nelson, Nagasawa, Ord, Prigogine and El Naschie on the other.

Endophysics is different from exophysics, for the physical laws which apply when one is a part of that which one contemplates are in general not the same as those which are valid from an imagined or real external vantage point. Gödel's undecidability also holds true only from within — from the inside of the mathematical system in question, that is.

In physics, one needs to incorporate an explicit observer into the model world, in order to make the reality which exists for him or her understandable. Endophysics entrusts us, as it were, with a "double access" to the world. Besides the direct access (through the interface of the senses), a second one is opened up based on an imaginary outside position. Is the so-called objective reality only the endo side of an exo world?

Time and again, the history of cultural productivity yields evidences that human beings divine the possibility that the world is only the endo side of an exo world. This hypothesis manifests itself in numerous pictorial representations, gnostic formulations, riddles and paradoxes. To illustrate the concept of the interface as the only reality, the model of the "Bubble Boy" is suggestive — he lives in a sterile plastic chamber with floating walls, communicating with the world only through the interface. The menu of his world programming is located on the keyboard inside the bubble. Our own macroscopic world is irreversible, but the bubble in which we reside is microscopically reversible — with counterintuitive consequences.

The fact that our world at the same time is nonclassical is not necessarily an objection. Indeed the classical time reversal invariance and the classical permutation invariance, enjoyed by equal classical particles, lead to "nonclassical" nonlocal phenomena. The "rest of the universe" is for the internal observer distorted in an incorrigible fashion. The world is made of rubber, but we do not realize this because we are made of rubber, too. The implied "simultaneity hypersurfaces" are, from the viewpoint of an external observer, warped in a most complicated fashion. The external observer feels tempted to drop "hints" to the internal observer that would enable him or her to glance behind the curtain. Unfortunately, we do not possess in our own world a similar "giant eye" which we might turn to for help. Unless, that is, we seek refuge in the construction of a fictitious all-knowing, all-powerful super-observer.

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The only scientific method for finding out whether or not our own world possesses an exo-objective flip side is the construction of model worlds (or artificial universes) on a level that lies below our own world. This way of proceeding is called endophysics.

The classical picture of an objective world (predictability, explicability, invariance, closure, causality, locality) can, nevertheless, give rise to nonclassical observer-centered effects, as Einstein proved with his special theory of relativity. The new endophysical principle of observer relativity (in place of mere frame relativity) will, perhaps, lead to a theory of Now and Death. Descartes' program of springing the prison of the *hic et nunc* through analytic geometry and the algebraization of experience is updated through the introduction of the observer as a source of covarying distortion. The manipulability of the jail of space and time grows by a notch. The world taken as a "repair shop for the wish machine" takes a step forward.

The endo approach offers a promise to the complex technoworld of the electronic epoch. The effects of the industrial (machine-based) and postindustrial (information-based) civilization — machinization, mediatization, simulation, synthetization, semiosis, artificial reality, deprivation of existence, etc. — are all drawn into a new discourse. The endo approach provides a new theoretical frame for describing and understanding the scientific, technological and social conditions of the postmodern world. For instance, the virtual worlds form a special case of endophysics. The issues raised by endophysics — ranging from observer relativity via the representational paradox and nonlocality to the problem of the world as pure interface — are central questions for our electronic-telematic civilization.

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