INTERNALISM: excerpted from:

THEORETICAL BIOLOGY AS AN ANTICIPATORY TEXT: THE RELEVANCE OF UEXKULL TO CURRENT ISSUES IN EVOLUTIONARY SYSTEMS

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ABSTRACT
Uexküll's work anticipates semiotics, autopoiesis, hierarchy theory, internalism, systems science, the information / dynamics dichotomy, as well as the social construction of knowledge aspect of postmodernism. I focus on his Theoretical Biology text. His central theory is that of function cycles, and his major effective image for evolutionary systems is the Umwelt . Internalism is the major current trend that function cycles relate to, and my discussion comes from that perspective, which I try to describe. I give a Peircean semiotic interpretation of function cycles. I attempt to relate Umwelt, an organism level concept, to the Hutchinsonian and Eltonian concepts of the ecological niche. This raises the question of evolution, and Uexküll's view of it was developmental rather than Darwinian. I consider how including human culture in the Umwelt model raises the issue of Bertalanffy's "deanthropomorphizing" of human Umwelten. Major problems raised are the relation between externalist and internalist discourses, and the exact nature of Uexküll's Impulse Theory concept.
KEY WORDS
ecological niche, endophysics, function cycles, internalism, specification hierarchy, Umwelt, vitalism

INTRODUCTION

I have recently realized that several of the ideas I have been working with since the early 1980's might have been derived in part from Uexküll's Theoretical Biology (1926). So this work can be viewed in retrospect as a seminal text in evolutionary systems discourse. This text shows early indications of, at least, internalist discourse, scalar and specification hierarchy theories, semiotics, systems science, the information / dynamics dichotomy, developmentalism, as well as the social construction of knowledge. In this paper I will be concerned mostly with relating Uexküll's concerns to internalist discourse (e.g., Matsuno, 1989; Kampis and Roessler, 1990). In this regard, I will make a Peircean semiotic interpretation of Uexküll's central theory of function cycles. Then I will try to relate what appears today to be the major sign of Uexküll's work -- the Umwelt -- to externalist concepts in ecology. Finally I will take up the implications of Uexküll's work for the social construction of knowledge.

Major problems raised herein are the relation between externalist and internalist discourses, including the problem of relating Umwelten to various concepts of the ecological niche. Also, I will be concerned to examine Uexküll's Impulse Theory as an internalist conception. This concept looks very like vitalism from the standard externalist perspective, and has been branded as such. If Uexküll's body of work has any chance of reviving today in science, I believe that it must be taken up into internalist discourse.

INTERNALIST DISCOURSE

An overview of internalism will be useful here. From the point of view of modern science, this is certainly among the most radical perspectives emerging at the end of the Twentieth Century. Internalism is poised over against externalism, which is just science as it has been, where the theoretician constructs a model of some part of the world as if (s)he were looking at it from the outside, therefore objectively. Such models are known to be partial (Rosen, 1985, Casti, 1989), and are focused only upon aspects of the world that may be viewed for practical purposes as being mechanistic. These models have, however, complete closure in their own sphere (Dyke, 1988), with nothing missing logically, and their purview is systemically global (Kampis, 1991,a; Matsuno and Salthe, 1995). There have been several attempts to move away from models of this kind in the direction of internalism as a response to the failure of externalist models when placed up against the complexity of the actual world and our own material situation in it. I will briefly gloss a few such approaches from the

Twentieth Century.

Dialectics (see references in Salthe, 1993,a) has been entrained by some into a hoped-for construction of a dialectics of nature (Engels, 1940). Such a discourse, involving dialectical logic, would be non-mechanistic and suitable to changing systems because it lifts the logical constraint of the excluded middle (Horn, 1983). Without that constraint, determinations become vague, or at least fuzzy, and this uncertainty is characteristic of internalism. Dialectics also contests the objective stance of Western science, suggesting instead that investigators are (and should be) not only observers, but actors in their own interests at the same time. Aside from the suggestion that natural systems might be viewed as being engaged in working through contradictions, the scientist is viewed as searching for ways to understand Nature that would lead to an increasing ability to interfere in natural processes. These instrumental values characterize modern science as well, but in that discourse the techniques of objective observation have been made into a metaphysical principle which is incoherent with these pragmatic aims (which, however, granting agencies keep in clear view). A major feature of scientific practice relevant to dialectics is the strategy of confirmation, rather than the strategy of testing. Here the scientist searches for evidence among natural systems conforming to some theory that would, if true, allow prediction. Evidence not in accord is put aside, as the theorist endeavors to construct a picture of the world, using both logic and esthetics, and guided always by pragmatic concerns. But it can be said that the dialectical approach has so far only succeeded as the basis for critique of other approaches.

A famous example of an internalist move in science was the Copenhagen interpretation of microphysics, suggesting the complementarity of particulate and wave / field representations of electrons, based on different ways of constructing them experimentally (Jammer, 1974). Here, and in the Heisenberg uncertainty principle as well, observer and experimental object are entangled; the known depends upon the knower, and the unknown is partly determined by the known. This resulted from attempts to observe phenomena of vastly different scale from the observer. Cosmology has been another source of internalist realizations driven by differences in scale of observer and observed. Here we are clearly inside the system we are observing, and this has some major consequences (Barrow and Tippler, 1986; Gale, 1981), not the least of which has been the realization that order and disorder can and do necessarily increase together (Layzer, 1976; Frautschi, 1982), entirely changing the import of thermodynamics for metaphysics (e.g., Salthe, 1993,a). And we should not forget the lesson concerning what can and cannot be known about the universe as a consequence of realizing that light propagates at finite speed. For example, we can never observe what is far away at the present time or what was near us long ago. Physics has been toying with internalism for some time.

Another perspective from physics that strongly resonates with internalism is operationalism (Schlesinger, 1967). Operational concepts are required for empirical science because it is not obvious, given our situation inside the physical world, that our conceptual tools -- say, length or temperature -- are formulated in such a way as to deliver consistent evaluations under varying conditions. Temperature may be measured in many different ways, each related to a different theory, but it would not be a fully operational concept unless they all converged upon one value in a given locale. If not, then one would have to specify which theory a given temperature reading relates to. And so, in testing some theory by way of predictions it makes about temperature change, one has to keep in mind that one is using a given theory of temperature, embodied in its form of measurement, that is not also being tested at the same time. In other words, there are really no absolutely reliable foundations for scientific knowledge, no standards external to scientific practice itself to which we can turn for certainty. In its most extreme form, as with Bridgman (1927), operationalism holds that concepts like temperature are nothing more than short-hand terms for the operations of measurement. That was a completely internalist view.

A related wing of internalist discourse can be found in constructivist mathematics (Bridges and Rochman, 1987; Mines et al, 1988). Here the view is taken that mathematical entities do not exist independently of our construction of them. Alvarez de Lorenzana (1998) has posited that self-organization might be modeled, using constructivist mathematics, as the self-construction of order. Here problems like: what does it mean "to construct" in natural systems might be broached using this mathematics. Self-construction is a construction from within, and so would necessarily be an internalist endeavor, where the observer / constructor is insde the system being modeled.

More recently, as an outgrowth of the recursive feedback principle of cybernetics, recognition of the problem of reflexivity and self-reference has grown in many fields (Ashmore, 1989). In cybernetics itself we have the growth of Second Order Cybernetics (e.g., Geyer and Van de Zouwen, 1990; Van de Vijver, 1992), where the observer is explicitly taken into account in representations of systems. A famous outgrowth of this movement was the autopoiesis of Maturana and Varela (1980, 1987). It can be said that this was the first extensive scientific attempt, after Uexküll, to describe systems from the inside. They attempted to construct a model, redolent of Bridgman's operationalism, of the internalist predicament of living systems, and they concluded that such a system could not be clearly differentiated from its environment internally because it interacts externally only by way of its own semiotic categories -- which externalists (and Uexküll as well) would take to be representations of environmental properties or relations. Autopoietic systems would be saved from solipsism, then, only by way of the natural selection of those with adequate predispositions (despite the fact that Maturana and Varela pose them as an alternative to Darwinism!). Externalist critics (e.g., Scheper and Scheper, 1996) have reacted predictably that this system of thought could not be usefully harnessed to the control of Nature. Autopoiesis has also been attacked from a more congenial perspective as being restricted only to homeostatic situations by Csányi and Kampis (1985), who advanced their own autogenesis as a successor internalist model capable of representing development and evolution.

Roessler (1987), Kampis and Roessler (1990) and Kampis (1991,a) have clearly described the situation with respect to externalist and internalist discourses in science, with their distinction between exophysics and endophysics. Exophysics is the classical way of constructing global mechanical models of aspects of the world with the purpose of making predictions. The key point is that in these models no new categories of constraints or variables can emerge during calculation of system behaviors. Such systems are unorganized, and might be simple or complex (requiring statistics), or may be organized but simple (machines), but not both complex and organized (John Collier, personal communication). Some systems that are both complex and organized are capable of constructing new components and subsystems out of preexisting internal ones, and these are referred to by Kampis as "component systems". Such systems are logically incomplete and continually self-creating ("self-modifying"). Their basic style of behavior is recursive, but they construct rather than compute, and so their inherent dispositions and categories may change. Although they are autonomous, they do not have closure in the sense that autopoietic systems do, and must continually search out new relations with their surroundings, and this, I believe, implies that they require internal representations. So their behaviors cannot be completely specified by way of external initial and boundary conditions nor by way of stable internal rules. When we have systems whose behaviors we fail to predict because they are changing internally, one approach (the endophysical) would be to try to delve inside them to see what is going on. What we would be attempting here is to make an externalist model of the endophysical situation -- an "exo-endophysical" model. I believe that this is what Uexküll tried to do. A more recent related approach is the ecological psychology of J.J. Gibson (e.g., 1977).

As a prime example of endo-exophysics (working outward to try to recover exophysics from the internalist predicament) we can turn to the efforts of Koichiro Matsuno (Matsuno, 1989, 1993, 1995, 1996, 1998; Matsuno and Salthe, 1995; Salthe and Matsuno, 1995; Kampis, 1991,b). We begin with the most reduced internalist situation one can imagine -- a local group of objects separated from others by material constraints on communication. We observe them at their own scale as they are buffeted by various forces in their environment, as well by each other's motions. Whatever rules of motion they have, they must accommodate contingency in the way of someone walking in a crowded city. The motions of the group result in the incorporation of historical accident as some of the many degrees of freedom of the system become frozen into a local record, which becomes one of the boundary conditions on further behaviors. This occurs because the system is material. The local group develops until its degrees of freedom have been used up, when it may disperse or be taken up into a larger collection of groups as a stabilized subunit, but we are mostly concerned with it prior to its end, in the middle of its trajectory. The future possibilities at any moment, even after most degrees of freedom have been used up, are indefinite, characterized only by vague tendencies; the system's propensities (Popper, 1990; Ulanowicz, 1997) could not be interpreted as actual probabilities. Such systems are creative, and live in a problematic world where their own activities create further disorder that they must deal with (Salthe, 1990). Since local interactions take time and must involve physical processes, there must be an exchange of information within and during interaction, which can therefore be interpreted as a kind of mutual observation or measurement among the local objects.

The kind of endo-exophysical question Matsuno asks concerning such local groups is how they may be related globally in terms of conservation, and whether they may become synchronized. For this purpose we may imagine an observer assembling a global record. This record, external to any locale, must show that all relevant properties are conserved overall, and should be able to allocate moments among locales so as to say when two things occurred simultaneously. Unfortunately, the material constraints on communication make this a formidable problem. If the outside observer is comparatively very large, it can assume that local inequalities in conserved properties will average out, while simultaneity becomes of no interest at all. But if the global observer is almost the same scale as the collections of objects, then simultaneity can be observed after the fact by tracing backward in the record as it arrived at the global station, but, of course, it cannot really be assessed between locales in the past, and certainly not in their futures. Conservation can be handled in one of two ways. Matsuno himself has argued that, since conservation must hold in any global record, then local activities must be considered to have occurred under the influence of a final cause, making sure that it would all come out OK in an overall record. Another possibility is that local records can be assumed to have numerous small errors here and there as a result of measurement limitations, and so the global record can be fudged so as to make it seem that conservation has been maintained -- within a margin of observational error.

Finally I would like to point out that, from the point of view of externalist science, semiotics can have no role at all. No meaning is held to pertain to Nature as it has been constructed therein, where Nature is held to merely exist. Semiotics is an internalist discourse, of interest only to entangled subjects that need to negotiate uncertain terrain, and who must read signs and interpret them successfully. Semiotics is really the basis of hermeneutics. The semiotics I will utilize herein is that developed out of the thinking of Charles S. Peirce.

With this background in internalist discourse in mind, we can now move back to the past work of Jakob Johann von Uexküll.

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