Exploring and Employing Autopoietic Theory: Issues and Tips

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The referential focus of this paper is not a hypothesis or theoretical point per se. Instead, it is the body of work (hereafter termed *autopoietic theory*) developed by Humberto Maturana and Francisco Varela. The intended audience is not a community of critical scholars per se. Instead it is the "community of interest" for whom autopoietic theory is at least an object of interest and at most an object of personal commitment. To the extent autopoietic theory has prospered and spread over the last quarter century, it has often been a function of highly interactive, even personal, relationships among self-acknowledged adherents and those generally interested. Owing to the distribution of such correspondents across diverse disciplines, their cohesion as a "community" has been tenuous at best. I wish to step back from the usual scholarly perspective and use this venue to address what may be termed the pragmatics of autopoietic theory. The intention is to offer some sort of "state of the community" assessment, recommendations, and / or tips regarding: (a) autopoietic theory's documentary corpus; (b) discourse on autopoietic theory; and (c) applying the theory in the context of focused research. The goal is to help orient newcomers and provoke reflection among the "veterans."

The points covered below are distilled from eight years' intensive experience in the context of: (a) my own applications of the theory in cognitive studies generally as well as the applied fields of group decision support, human-computer interaction, and enterprise knowledge management; (b) personal consultations with other researchers worldwide; (c) the occasionally lively debates from the ThinkNet autopoiesis forum; and (c) the general flow of discourse deriving from my role as editor of *The Observer* and manager of *The Observer Web*. This last source of material currently entails direct interactions with over 500 persons annually, ranging from simple "help desk" functions for newcomers to extended debates with scholars from diverse disciplines.

The format will be a listing of position statements arranged by theme. Each such statement focuses upon a point or issue which has demonstrably affected the application of autopoietic theory to constructively leverage actual research topics. My criteria for inclusion in this list include: (a) frequency of occurrence (e.g., number of times the issue arises in questions or discussions); (b) criticality of the topic to constructive application of the theory; and (c) criticality of the topic to integration and extension of the theory as developed over the last quarter-century.

I. Becoming Acquainted with Autopoietic Theory

This first section will address topics relevant to general exploration of the theory, particularly as they relate to "the basics": access to the theory's documentary corpus; level of effort required to obtain a working familiarity with the concepts, and the demonstrated shortcomings of relying on the most popular account of Maturana and Varela's work. I shall address these in reverse order.

A. One Evolves by Climbing Down from *The Tree ...*

One of the key scenarios in the canonical story of human evolution is that in which our arboreal primate ancestors, as a result of widespread climatic changes, descended from the shrinking population of trees and began to walk the grassland savannas of Africa. This migration, so the story goes, promoted bipedal locomotion and freed our grasping forelimbs for other purposes. The most significant result was that manipulative mischief termed "technology" which, for better or worse, remains the hallmark of our species and our presumptive standard for ascribing intelligence (in the colloquial sense -- not as analyzed by Maturana & Guiloff, 1980). Metaphorically speaking, there is a similar improvement to be gained in leaving the safe softness of *The Tree of Knowledge* (Maturana & Varela: 1987; 1992) to hone our scholarly and applied capacities. When *The Tree of Knowledge* was first published in 1987, I had hoped it would serve as a "gateway" through which new audiences would be introduced to autopoietic theory. The realization of that hope has further evidenced the risk in getting what one wishes for.

This book was commissioned and developed to provide a fresh perspective on "...the many difficulties confronted in social communication and knowledge transfer" (Maturana & Varela, 1992, p. 11). As such, it targets a general audience, prioritizes breadth over depth, and focuses on the interactional aspects of the theory (e.g., languaging) at the relative expense of those rigorous fundamental constructs from which the presented perspective was derived. This is entirely justified in a publication intended for a popular audience. The problem is that a majority of newcomers to our community know autopoiesis solely on the basis of this book -- *a book which in fact provides no detailed definition for autopoiesis at all*. Such definition effectively begins and ends with the phrase "...continually self-producing" (p. 45) -- a passage into which novices have demonstrated the ability to project a dizzying range of interpretations. As a result, there is a strong correlation between sole reliance on this book and invocations of the theory which are (e.g.) fragmentary, distorted, or clearly erroneous.

Which leads me to the next issue ...

B. There is No Royal Road to Autopoiesis

The problems surrounding *The Tree of Knowledge* are not the fault of Maturana and Varela, who explicitly developed the book as a summary overview for a popular audience. The problem lies instead in the fact that this offering -- planned as an appetizer -- has been widely and presumptively consumed as if it were a main course. Autopoietic theory is difficult to assimilate -- not because of any intrinsic complexity per se, but rather because of the novelty of its

fundamental stance. Phrased another way, the real effort in "penetrating" Maturana and Varela's work lies not in digesting minutiae, complications, or convolutions. It lies in the disciplined adoption of the mechanicistic, structure-oriented mode of explanation upon which the theory has been formulated. In my experience, this means that newcomers to the theory must "get it" (i.e., they must apprehend the basic orientational gestalt) with respect to this stance before they can proceed smoothly along the explanatory progression of the core literature. Furthermore, I have yet to encounter a newcomer who demonstrably "gets it" prior to assimilating at least one of three core sources: *Autopoiesis and Cognition* (Maturana & Varela, 1980); *Principles of Biological Autonomy* (Varela, 1979); or a broad selection of the original 1970's-vintage papers from which those books are distilled.

As a result, I typically wince when approached by a querent whose sole exposure to Maturana and Varela's work is *The Tree of Knowledge*, because I have learned that this sole-source status is highly correlated with misorientation to the tone and tenets of autopoietic theory. This conclusion would be pessimistic only to the extent it connotes an exclusivity -- i.e., to the extent it precludes newcomers from the quite rich (and enriching) qualities of the theory. No such exclusivity is implied. The obvious (and the only) solution is to proceed farther -- to move beyond the appetizer to the main course(s), to pass through the gateway into the broader realm it accesses. Unfortunately, such extended exploration of the literature is not easy, because ...

C. The Documentary Corpus of Autopoietic Theory is Difficult to Access

During the period 1989-1991, I had the luxury of (a) being tasked to explore autopoietic theory in an ongoing study circle environment and (b) having at my disposal the full resources of a research library staff who loved a challenge. The challenge I gave them was to assemble a complete collection of the English-language literature on autopoiesis. Although this goal was accomplished, it proved so difficult that even under these convenient circumstances there were times when extraordinary measures had to be taken (e.g., large-scale searches on 3 continents, outright purchase of some otherwise unobtainable papers). Perhaps the most disturbing aspect of all this was that some of the most critical papers were the most difficult to obtain. The two best examples of this are Maturana's essays *Biology of Language* (1978a) and *Cognition* (1978b). The former is, in my opinion, still the single best presentation of "languaging" to be found, and the latter includes some points and comments not to be found in the multiple similar papers published during the 1970's. In fact, I would never have obtained a copy of *Cognition* but for a remarkable coincidence in which a colleague at Umeå Universitet (thanks, Kenneth Nilsson!) recalled having stored away the rare German volume (Hejl, Kö ck & Roth, 1978) within which it appeared in one of multiple storerooms holding the overflow from his incredibly vast personal library.

Years later, the situation is still somewhat of a problem -- even with respect to the core literature. *Principles of Biological Autonomy* (Varela, 1979) has been out of print for years, and *Autopoiesis and Cognition* (Maturana & Varela, 1980) is only available via special order. This means that the most accessible book-length treatments of autopoietic theory are *The Tree of Knowledge* (Maturana & Varela: 1987 / 1992 / 1998) and *Self-Producing Systems* (Mingers,

1994). My opinion of the former is discussed above, and the latter (although largely faithful in presenting the basics) contains enough of Mingers' personal opinions to make me hesitate in recommending it as a starting point.

D. Summary

My point is to advise newcomers (and remind veteran adherents) that autopoietic theory is not as readily available for exploration as other emergent scientific perspectives (e.g., chaos theory) promoted in the popular press (e.g., Capra, 1996). The reasons include: a chronologically convoluted publication output; relatively obscure primary source documentation; a seemingly inverse relationship between key documents' availability and their expository "substance", and a requisite level of exploratory effort which is heightened by the novelty of the theory's perspective.

The "not-so-good" news is that nothing beyond encouragement can be offered on the level of effort issue. The "better" news is that *The Tree of Knowledge* remains a good and entertaining entry point into this work. My comments above were intended only to emphasize that although this book is a good place to start, it is not a good place to stop. The really good news is that there are signs of improving access to much of autopoietic theory's core documentation. Here in the autumn of 1997, a collection of Maturana's papers (including many which have been difficult to obtain) is being released. This is the first such compilation of his works to be made available as a set. In January 1998, the first open workshop on the biology of cognition and language will be conducted in Santiago. In March 1998, Shambhala Press plans to reissue *The Tree of Knowledge*. On an ongoing basis, papers and other documents are being made available on the World Wide Web. We can only hope that this trend will continue, and that access to this substantial body of work will become widely accessible in coherent form and with comprehensive coverage.

II. Issues of Discourse on Autopoietic Theory

This section concentrates on some seemingly trivial issues which persistently plague adherents attempting to discuss or promote Maturana and Varela's contributions. One would like to think these issues are not worth mentioning, but I've found them to repeatedly arise to negative effect.

A. A Theory by Any Other Name ...

One of the frustrating problems in discussing Maturana and Varela's contributions is the lack of a single accepted label for addressing them. In the core literature, the few allusions to the whole of the theory are typically referenced as "biology of cognition" (cf. Maturana & Varela, 1992). A variety of authors have defaulted to "theory of autopoiesis" (cf. Maturana, 1981, p. 21) or even "autopoiesis theory." Along with many others, Mingers (1994) simply refers to the work as "autopoiesis" -- an obvious option, but one which blurs the distinction between the entire

theoretical corpus and its best-known formal construct. Zeleny (1981b) uses both "autopoiesis" and "theory of autopoiesis" (apparently as interchangeable labels) in the space of a couple of pages. After a good deal of thought, I finally gave up and adopted "autopoietic theory" as the generic label (cf. Whitaker, 1992, p. 70). More recently, Capra (1996, p. 174) uses the term "Santiago theory." Until one or another label gains widespread usage, it will continue to be the case that referencing Maturana and Varela will entail some amount of explanatory overhead.

B. The Nomenclature of Autopoietic Theory is Problematical in Practice

"What's in a name?" Apparently, more than one would suppose. What would appear to be a trivial issue has proven itself time and again to be a critical obstacle in presenting, discussing, and debating autopoietic theory with those not deeply familiar with its tenets. This is the issue of terminology. The explanation of the theory's terminology to outsiders is difficult enough in and of itself. In this section, I shall focus on the problem of nomenclature which presents particular referential "dissonances" when used in interactions with people not intimately familiar with Maturana and Varela's work. This will be illustrated with respect to three key terms (organization, structure, and closure) so denotatively and connotatively "loaded" in so many scholarly fields that their invocation is practically guaranteed to induce explanatory digression.

Of the three terms listed, the one which has been most problematical in practice has been 'organization.' Let me illustrate this with a concrete example. In 1992, Raul Espejo was making a presentation on applying autopoietic theory in the area of management of large enterprises. The first overhead transparency he displayed gave a definition of "organization" (in its autopoietic sense). The audience, comprised of students, professors, and researchers, quite simply "broke down" because of their inability to distinguish between this usage of the term and their more familiar application of the word to denote a large communal enterprise, a hierarchical ordering, etc. As it turned out in this case, Raul spent the remainder of his allotted time digressively explaining (and debating) this initial definitional point, which in turn meant that his lecture ended before it had effectively begun.

Given the foundational status of these terms, there is little recourse other than explicit clarification of intent in using them. For example, Mingers (1994, p. 119) reserves the term "organization" (lowercase) for Maturana and Varela's formal usage, while invoking "Organization" (capitalized) to connote social collectives ("...clubs, businesses, etc...."). Whitaker (1992; 1995a; 1995b), like Mingers, limits "organization" to its autopoietic usage and reserves the term "enterprise" to denote the sort of purposeful social collectives addressed in management and "organizational" research. Somewhat surprisingly, no terminological distinction is employed by von Krogh and Roos (1995) in a book whose focus is on the intersection of autopoietic theory and "organizations." They instead rely on narrative context to differentiate between the colloquial and specific usages of the term.

The term 'structure' has also been problematical in usage. Andrew (1979) wrestles with the fact that Maturana and Varela's definition contrasts with more conventional applications of the term, and Mingers (1994, p. 14) agrees. Jantsch (1980b, pp. 82-84) employs 'structure' to denote the

fifth of his "seven levels of dynamic system aspects." This usage apparently corresponds to that in his book *The Self-Organizing Universe* (1980a) in which it (in the particular guise of "space-time structure") "...includes the function of the system, and thus also its organization and its relations with the environment." (p. 34). It should be clear that Jantsch's subsumption of these factors makes his usage quite distinct from that of Maturana and Varela.

Then there are those authors who launch into their invocations of autopoiesis in total disregard of the fundamental organization / structure distinction. Luhmann (whose purported integration of autopoiesis and societal analysis serves as a "gateway" into the theory even more problematical than *The Tree of Knowledge*) completely dispenses with the distinction, and employs these two central terms in their colloquial sense(s). As a result, Luhmann's monumental *Social Systems* (1995, Chapter 8) approaches this key conceptual distinction only to the extent he uses the word "structure" as a loose analogue for organization -- an analogy which disintegrates when he uses it as an complement of "process" (precisely the conventional usage cited by Andrew and Mingers). The effect of this omission on the validity of Luhmann's application of "autopoiesis" is left to the reader as a reflective exercise.

Finally there are the recurrent problems associated with the use of the term "closure." It has become something of a cliche that someone will bring up a question concerning the relation of closure to the earlier cybernetics construct of "closed system." Although Maturana himself (1980, p. 54) uses the term "closed system" in introducing autopoiesis, he (a) specifically qualifies this "closure" with respect to the system's organization and (b) proceeds to delineate how (in terms of their structure) autopoietic systems "...operate as materially and energetically open systems (in continuous material and energetic interchange with their medium)". This citation will suffice to demonstrate the difference between the open / closed dichotomy as it is employed in first-order cybernetics versus autopoietic theory.

C. Spare Me the Factionalism

In recent years, I have often encountered an attitude (most particularly among students) which constitutes not just a threat to the community of our community of interest, but a threat to the prospects for advancing the theory around which that community has coalesced. This is an attitude of factionalism, most commonly evidenced by dismissive categorizations of people or works to either a presumed "Maturanista" or "Varelista" camp. Allusions to differences of opinion between the theory's progenitors date back two decades (cf. Maturana's Introduction to *Autopoiesis and Cognition*). Zeleny offers some of the few particulars attributed to a Maturana vs. Varela schism, casting it in terms of: (a) whether autopoiesis is a sufficient (as well as necessary) condition for biological phenomena (1981b, p. 2); (b) the ascription of autopoiesis to dissipative structures (1981c, p. 35); and (c) the "...'paternity claim' for the concept of autopoiesis..." (*Ibid*). More typical are hints of disagreements concerning (a) the ascription of autopoiesis to multicellular systems and / or (b) the ascription of autopoiesis to unities in phenomenal domains other than the biological (e.g., to social systems as unit objects of study). Both these alleged points of disagreement pertain to secondary or derivative aspects of the theory, and neither in fact demonstrates any tension with respect to the basic stance or core

constructs of their work.

Whatever differences may have pertained in the past were at least delineated with respect to specific theoretical points. The "Maturanista vs. Varelista" sentiment encountered today is rarely justified by anything so tangible. Self-styled partisans of each camp decry the other for drifting away from disciplined scientific analysis toward evocative, feel-good "New Age-ism." If one were to judge from repeated comments made in the ThinkNet autopoiesis discussion forum, the Varelistas base such accusations on (e.g.) Maturana's nascent popularity among the wellness / therapeutic crowd, and the Maturanistas base theirs on (e.g.) the emphasis given Buddhist philosophy in *The Embodied Mind* (Varela, Thompson & Rosch, 1991). At this point, the purported dichotomies and exclusive allegiances become positively silly. The occurrence of such petty name-calling should be beneath comment, and any persistent recourse to such behavior should be beneath contempt.

III. Issues in Applying Autopoietic Theory in Research

At this point, I would like to offer some observations on applying autopoietic theory in the context of scholarly research. No specific methodological orientation (e.g., qualitative vs. experimental) is presumed, and these comments are of a general nature.

A. Using the Theory Entails More than Simply Invoking One Piece of It

There is an old cliche to the effect that "If you give a child a hammer, then everything (to that child) begins to look like a nail." Metaphorically speaking, giving the formal construct of autopoiesis to scholars has resulted in a similar effect -- their invocation of Maturana and Varela's work is commonly limited to ascribing autopoiesis to a phenomenon of interest. This has occasionally led to questionable, and even ludicrous, results. For example, Nissan (1987 -- not to be confused with this symposium's attendee Professor Hans-Erik Nissen) presents a notion of "attribute autopoiesis" to characterize reproduction (as contrasted with self-production) of data structures in artificial intelligence. Jumarie (1987) invokes the term in the title of a paper within which he does not address autopoiesis at all, but rather develops a conventional Shannonesque notion of "information" qualified with respect to teleonomy (both of which are specifically dismissed by Maturana and Varela). The most widely-known such "hammer blow" is, of course, Luhmann's (e.g., 1995) blanket ascription of "autopoiesis" to social systems. Elsewhere I have (politely) described this as a "case not yet made." (Whitaker, 1995)

The source of these and similar confusions appears to be a presumed equivalence between "autopoiesis" (a specific formal construct) and "autopoietic theory" (a body of scholarly work within which "autopoiesis" is a core concept). To some authors, the viability of the construct for their purposes circumscribes and determines their adherence to the general theoretical corpus. In the best case, this would be a reasonable procedural heuristic -- provided the construct were applied without distortion and with regard to the full range of its connotations. In practice, neither of these conditions are typically met. The above-cited Nissan and Jumarie examples

illustrate failure to meet the first condition, and (regardless of one's assessment of its viability or utility) Luhmann's work constitutes an example of the second (cf. my comments on Luhmann in the *Nomenclature* section). Which leads me to the next point ...

B. Choosing to Use the Theory Entails More than Assessing One Little Piece of It

The foregoing allusion to selection of "autopoiesis" at the expense of its full connotations has a more general analogue in the selection of one or another specific tenet as representative of the theory as a whole. Overemphasizing an isolated portion of the theory at the expense of the total explanatory complex can lead to seemingly curious conclusions or results. Autopoietic theory is comprised of a number of mutually defined (and mutually defining) constructs. Acceptance of the theory is a matter of a given scholar's judgment. The point I am trying to make is that such judgment is likely to be sound to the extent it considers the theory in its totality.

A recent example illustrates such selective assessment. Emmeche (1994) surveys the field known as *artificial life*-- i.e., the simulation of living systems in the virtual medium of computer software. In discussing what might be meant by "life", he quite reasonably alludes to autopoietic theory as a candidate source of illumination. After all, it provides the only systematic and systemic delineation of living systems. For whatever reason, Emmeche's approach to the notion of autopoiesis focuses on one and only one aspect of autopoiesis -- Maturana's position that a system is either autopoietic or it is not (i.e., that there is no intermediate state) (pp. 24-25). In the final analysis, Emmeche dismisses autopoiesis (and, by extension, all of autopoietic theory) from consideration on the grounds that such an "all-or-nothing concept" fails to usefully inform the discussion (pp. 37-39). What is problematical here is not Emmeche's conclusion per se. It is the microscopically narrow basis upon which he evaluates the utility of autopoietic theory for his purposes.

C. Applying Autopoietic Theory Entails Interpretation and Creativity

Autopoietic theory is essentially descriptive. It offers a complex of constructs and tenets which comprise a coherent explanation for living systems, the mode of their operation, and (given a sufficient level of self-engagement) their cognitive activity. Coherence of explanation, however, does not necessarily provide a foundation for any and all types of research to which one might wish to apply the theory. To use current business jargon, the utility of a theory is proportional to the extent to which one can "leverage" an issue or "get traction" with respect to it. The methodological approach most readily supported by such a descriptive theory is interpretive analysis -- e.g., rhetorical demonstration that a given system exhibits features or behaviors consistent with the theory's constructs. Not surprisingly, the most elaborate invocations of autopoietic theory to date have involved analyses of phenomena with regard to whether or not they exhibit autopoiesis. Examples include accounting (Robb, 1991), law (e.g., Teubner, 1988), and society in general (Luhmann, 1995).

But how can one employ a descriptive theory in support of something other than interpretive

analysis? This requires creativity, in the sense that one must proceed from an understanding of autopoietic theory toward those effects or orientations corresponding to the theory's general stance and specific tenets. In the foregoing sections, I pointed to problems which are each instances of a problematical selectivity of a part in isolation from the entire explanatory context which affords it meaning. This is not meant to imply the application of autopoietic theory is of an "all-or-nothing" nature, analogous to Emmeche's narrow assessment of the construct "autopoiesis." It is only meant to emphasize that invocation of any component of the theory should be consistent with (a) its role in the totality of the theory's explanatory framework and (b) the methodological and orientational stance underlying the theory's development to date.

Ironically, the risk of ignoring these conditions is well-illustrated by the book through which many first encountered autopoietic theory -- *Understanding Computers and Cognition* (Winograd & Flores, 1986). Although these authors invoke Maturana to illustrate an alternative viewpoint on cognition, they veer away from autopoietic theory in developing their main thrust -- a coordination system specification based on Searlean speech act theory. Even a cursory exploration of this dominant branch of speech act theory will reveal it as an instance of the Anglo-American analytical philosophy of language which (e.g., via its rationalistic / cognitivistic presumptions) contradicts the notion of "languaging" as developed by Maturana (1978) (cf. Whitaker, Ö stberg & Essler, 1989).

Let me close by giving an example of how the theory can be constructively brought to bear on actual research issues, with respect to the notion of *domain*. The core literature is full of references to (e.g.) cognitive domain, phenomenological domain, domain of interactions, and the like. Maturana and Varela use the term generally to connote a 'realm' or 'sphere' circumscribing: (1) the relations among observed systems and the unities (medium) with which they can be observed to engage (e.g., phenomenological domain) or (2) the foregoing plus all potential states of relation and/or activity among the given unities (e.g., domain of interactions). In these senses, a domain can be construed as a description or circumscription of experiential flux via reference to current status and possible trajectories.

What is important is that a close reading of (e.g.) *Autopoiesis and Cognition* will reveal that observation, description, and explanation (the theory's elements most relevant to research practice) are all circumscribed with respect to one or more domains. This is not to say that the course or trajectory of such activities are determined simplistically by their domanial affiliations -- only that they are bounded or qualified with respect to that domain's manner of delineation and state. This *domanial qualification* is a key background theme in the theory, and it can be leveraged toward the end of circumscribing what can be observed, described, and/or explained in the course of research. To be frank, over the years I've found domanial qualification to be the most frequently useful element of autopoietic theory, and I employ it in the manner of an analytical heuristic even where the notions of autonomy and/or autopoiesis are not at issue.

IV. Summary

This concludes my presentation of selected issues on autopoietic theory as an object of

exploration, a subject of discourse, and a tool for ongoing research. For those who insist on a methodological pigeonhole into which to categorize this contribution, it will suffice to label it a summary qualitative analysis of discourse among members of the global autopoiesis community during the period 1990-1997. To the extent my points prove unsettling to this community's "cognoscenti" or daunting to its recent arrivals, I will have accomplished my minimum intended purpose. To the extent it motivates action toward tangible progress in this community as a scholarly network and in the theory binding that network's diverse participants, this little diatribe will have realized my best hopes.

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