

■ Research Paper

The Paradox of Observing, Autopoiesis, and The Future of Social Sciences

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The current debate in social sciences show that the paradox of observing—the embeddedness of observer in the process of observing—is at the heart of the controversy about their cognitive status and future. Although the problem of observing has been addressed in numerous theoretical perspectives—some of which (Habermas, Leydesdorff, Maturana, and Luhmann) are examined in this article—the prospects for resolving this paradox remain problematic. Locating a point, which allows reflection on the process of autopoiesis in general, not just the operation of a particular autopoietic system, may be one condition for resolving this paradox. Such point will offer reflection on all autopoietic systems, including the observer. The dynamic balance between equilibrium and disequilibrium is the mechanism, which regulates the process of autopoiesis. Since the function of regulation is essentially a reflective function, this equilibrium between equilibrium and disequilibrium, which can be identified with the concept of homeorhesis introduced by Conrad Waddington, may offer a possibility to reflect on the process of observing. Copyright © 2007 John Wiley & Sons, Ltd.

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THE REPRESENTATIONALIST– ANTI-REPRESENTATIONALIST CONTROVERSY

Contemporary debates about social sciences reveal serious disagreements about their cognitive status and future. Whether these disagreements amount to a crisis or are as unprecedented in the history of social sciences

as some observers and participants conclude, is a matter of contention. However, few will disagree that the current debates raise issues that go to the heart of the field of social studies as it was defined and codified at least since the middle of the nineteenth century.

Although one could justifiably argue that distant rumblings of these debates could be heard even before World War II, there is hardly any doubt that the main storm gathered and reached its peak in the years after it (Novick, 1999). Triggered by the feminist, post-structuralist, and post-modern critiques of the

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social sciences, the current debates seem to have fermented in the broad changes in the institutional status, cognitive apparatus, and epistemological approaches of social sciences, as well as, more generally, in the growing awareness of autonomy and agency characteristic of the cultural climate that emerged after the Second World War.

Although the debates have been going on for quite some time, their shrillness shows no signs of abatement, as arguments and mutual accusations continue to be traded across the fault lines and reputations continue to be created and destroyed. It is the sustained intensity and acrimony of these debates that cause some observers to regard them as a genuine crisis in social sciences (Appleby *et al.*, 1994).

The participants in these debates fall into two principal, largely self-defined groups: representationalists and anti-representationalists. Representationalists defend the capacity of social sciences to establish a fundamental correspondence between our knowledge about society and the social 'out-there', and to capture in their categories and interpretations the elusive object of their investigation. Their opponents argue that since social reality, just as any other reality, is not directly accessible to human mind and has to be mediated by and refracted through mental constructs, social sciences in principle cannot make any hegemonic claims regarding the veracity of the knowledge they produce.

It is difficult to read the contributions to these debates without taking sides. Since neither representationalists nor anti-representationalists invite reconciliation, many readers do take sides. There have been few, if any, attempts at a synthesis or a definitive resolution of the conflict. As an impartial observer reads through various contributions to these debates, he or she cannot help wondering about the source of the controversy. What is at the root of these debates? Why are they taking place? Why are they so acrimonious? Will the controversy ever be resolved? Those who see these debates as a sign of crisis may be wondering if social sciences will ever overcome it or perish in the barren landscape of mutual destruction. Some even prophesy the end of social sciences. Keith Jenkins

finds it easy to imagine, for example, that history as a field of inquiry may be 'just local, temporary phenomena' that will cease to exist 'in a 100 or 200 years time' (Jenkins, 2000, p. 198).

One interesting fact that strikes an observer is that the two sides have more in common than may appear at first glance: they share many fundamental assumptions, use the same foundational texts, and have similar values and political loyalties. And yet, they find absolutely no possibility for reconciliation. The exchange that took place a few years ago on the pages of the journal *History and Theory* between the representationalist Perez Zagorin and the anti-representationalist Keith Jenkins is a good case in point (Zagorin, 1998; Jenkins, 2000).

Looking past mutual misconceptions, accusations (justified and unjustified), and misrepresentations, an analysis of the substantive arguments in this debate reveals how much the two sides have in common. For example, just like the representationalist Zagorin, the anti-representationalist Jenkins believes that there is such a thing as reality, which exists independently of our minds. Jenkins, with Richard Rorty, has no problem accepting that 'the world exists independent of, and is irreducible to, human mental states' (Jenkins, 2000, p. 184). In his words, 'not a single "postmodernist" ... is actually an anti-realist' (Jenkins, 2000, p. 183). One may doubt the validity of Jenkins' conclusion, as Zagorin does in his subsequent 'Rejoinder', but one can hardly doubt what Jenkins is saying in this quote.

Just like Jenkins, Zagorin 'finds no difficulty in recognizing that, for example, any entity, event, object, or work of imagination can be described in different ways, depending on one's interest, the questions one asks, one's criteria of relevance, and so on' (Zagorin, 2000, p. 206). For all his advocacy of objective truth, his claims that a correspondence between reality and knowledge can be attained, and his defense of the capacity of normal historical practice to reconstruct historical reality (Zagorin, 1998, p. 10), Zagorin concedes that writing history involves the creative agency of the historian, and hence is affected by subjectivity (Zagorin, 1998, p. 21). He admits to the constructed nature of human perceptions and even regards human constructs

as a part of objective reality. He suggests, for example, that 'narrative sequence or structure may be regarded as in some measure an attribute of the events themselves' (Zagorin, 1998, p. 20).

Both authors pay their respect to sound practices of historical writing, such as logical presentation and use of facts and reference apparatus. Both accept the notion of non-transparency of language. Yet, despite all these similarities, they do their best to convince the reader that there can hardly be more irreconcilable positions than those they represent.

One can start an analysis of the exchange with an observation that both contributors operate within essentially the same intellectual universe based on binary oppositions (for example, between mind and reality, nature and culture). They draw their diametrically opposed perspectives—one that insists that a correspondence between reality and knowledge is possible and the other, which deems such correspondence impossible—from essentially the same conception of knowledge. Both of them recognize the constructed nature of knowledge. However, as real as the process of constructing knowledge is for both authors, they have difficulty in considering it as part of objective reality. This similarity is particularly evident in their treatment of fact. Zagorin is disquieted by what he regards as the ultimate postmodernist statement that there is nothing outside the text, which, to him, implies that 'historical facts are products of discourse' (Zagorin, 1998, p. 20). In his view, facts are part of the extra-discursive reality and they derive their essential meaning from that reality (although one may be wondering how Zagorin reconciles this view of fact with his general acceptance of the constructed nature of perception).

Jenkins' approach towards facts is more consistent with his view of knowledge as constructed. For him, words which give meaning to historical, social, or for that matter any other facts, are part of discursive, not objective reality. In contrast to objective reality which, according to Jenkins, is 'out there' and which we cannot capture in our concepts and categories, the discursive reality is relativistic and, hence, the meaning of facts which appear within this reality,

just as the meaning of the discourse itself, is relative.

At first glance one may see no similarity between these two positions. Jenkins, for whom facts and their meanings are part of discursive reality, asserts that this meaning has little to do with whatever exists 'out there'. For Zagorin, the essential meaning of facts, just like facts themselves, is extra-discursive. In other words, such essential meaning is implicit in facts and is, therefore, unconstructed. However, on close analysis the two positions seem to be derived from the same inconsistent view of the process of constructing knowledge: they regard the process of construction as real but see no way of relating its products to what they understand as objective reality. For Jenkins, if facts are constructed, then they are not real but are mere conventions. Zagorin, who accepts the givenness of facts, follows essentially the same logic and exempts the essential meaning of facts from the act of construction.

The common inconsistency with regard to construction of knowledge suggests that both authors stumble over the same problem which is related to observing. For both Jenkins and Zagorin, observing is not a passive reception of external information. They both recognize that the act of observing is an act of construction and therefore involves the subjectivity of the observer. However, the recognition of subjectivity creates a problem. **Claims of objective knowledge require that the process of observing should be also included in the field of vision of the observer. Yet, in the mental universe of both authors there is no position which would allow the observer to observe the observing. For this reason, the recognition of subjectivity undermines any claim of objective knowledge. Neither Jenkins nor Zagorin resolves this problem.** They merely dismiss it. While Jenkins denies any possibility of objective knowledge (since there is no possibility of observing the observing) and rejects correspondence between reality and representations, Zagorin simply removes the observer from the act of observing/constructing the essential meaning of facts. This essential meaning, according to Zagorin, is what makes objective representation possible. In his view,

subjectivity affects only relationships among facts but not facts themselves. The exchange between Jenkins and Zagorin also suggests that these palliatives do not satisfy their respective proponents. Both are troubled by the internal inconsistency, which destabilizes their respective positions. Rather than recognize this fact, they blame each other's position, and not their own inconsistency, for destabilizing social sciences. Incidentally, this projection of their own insecurities on each other may explain the acrimony of the debate which has no resolution because both sides refuse to deal with the real source of perturbation.

The analysis of the exchange between Jenkins and Zagorin shows that the source of the controversy between representationalists and anti-representationalists is the status of the **observer, more specifically the embeddedness of the observer in the process of observing. Any** claim of objectivity requires a critical stance. That is, the act of observing must include an observation of the act of observing. However, an act of observing inescapably embeds the observer in the process of observing. The question then is: How can one be embedded in the process of observing and yet be able to observe it? Where can one locate a position which would allow such double observing? Is it possible to observe the observing without getting into an infinite reflective regression? Neither representationalists nor anti-representationalists answer these questions. Both sides have been unable to resolve the paradox of observing. Reliance on normative practice of social scientists recommended by the representationalists (which is also fully supported by the anti-representationalists) is highly problematic since this approach implies that an observation of facts is an operation which is completely different from an observation of their relationships. The anti-representationalists emphasize this point. However, their solution is also hardly a solution: they merely refuse to allow the paradox of observing to dominate over the creative enterprise of social scientists. As the example of the exchange between Zagorin and Jenkins shows, both sides seem to be troubled by their own internal inconsistencies which destabilize their positions,

yet refuse to recognize them (as evidenced by the fact that their respective positions include propositions which are very similar to those they criticize in their opponent's perspective). The fear of internal instability may be the factor that fans the vehemence of these debates. Both sides project their fears and insecurities on each other and regard each other as an external source of perturbation.

SOME THEORETICAL PERSPECTIVES ON THE PARADOX OF OBSERVING

The paradox of observing has surfaced in a variety of theoretical perspectives which deal with construction of knowledge. In his theory of communication Habermas argues in support of a possibility of objective knowledge, which involves a critical stance of the observer. According to Habermas, language used in accordance with the rules of rational discourse may allow the observer to overcome his or her own limitations and attain knowledge which would have universal validity. Language, according to Habermas, has a complex structure that makes communication possible both on the psychic level and on the level of social systems. This complex structure allows language to serve as an integrating operator which, when used in accordance with norms of rationality, can result in a genuine consensus and an objective representation of reality. For Habermas, this consensus is counterfactual—a mere idealization that should guide us in our aspiration toward objective knowledge and genuine social progress (Habermas, 1985).

Habermas' philosophical and sociological views have been strongly influenced by the theoretical legacy of Jean Piaget. In his essay 'Toward a Reconstruction of Historical Materialism', for example, Habermas recognizes his debt to the father of genetic epistemology when he writes: 'Only the genetic structuralism worked out by Piaget, which investigates the developmental logic behind the process in which structures are formed, builds a bridge to historical materialism' (Habermas, 1979, p. 169). According to the theory of communicative action,

communication constitutes the basis of social life. It is predicated on the ideals of truth, objectivity and rationality. These ideals are implicit in formal logical operations which, according to Piaget, are characteristic of the later stages of the child's development (Piaget, 1965). In his discussions of the development of formal logical operations, Piaget has emphasized that they evolve from concrete operations which are ultimately rooted in the organism's physiology and biology, i.e. in the sphere of unconscious functions of the organism. It is not clear why Habermas has chosen to make changes in this sequence and regard as the fundamental condition for communication, and hence social life, what Piaget considers a product of a long evolution which involves social interactions.

Misappropriating Piaget's theory and positing as the initial condition what, for Piaget, is a product of a long evolution makes Habermas' theoretical endeavour look like another foundational meta-narrative. Piaget's theoretical perspective hardly lends itself to foundationalism. Foundational meta-narratives are characterized by an epistemological approach which is predicated on a transcendent position of the observer and precludes a critical stance toward his or her own act of observing. The position of the observer lies entirely outside the plane of interpretation. This certainly makes it impossible to observe the observing. Habermas, for example does not explain his foundational proposition regarding the possibility of communication. Piaget does not make such foundational claims. According to his theory, there is no foundational moment, for example in the rise of consciousness; it gradually emerges from sensory-motor operations which in turn have their origin in physiological functions and biology of the organism (Piaget, 1971). Piaget shows that consciousness and reason have their roots in the processes of conservation and regulation of the biological functions of the organism and hence in the sphere of the irrational and unconscious.

Habermas has failed to resolve the paradox of observing. As a result, rather than being part of the solution, his theory has become part of the controversy. This failure has opened his theory to

criticism. For example, Niklas Luhmann has challenged Habermas's rationalist approach to communication (Knodt, 1995). Others have charged that his theory lacks a critical dimension and represents just another foundational meta-narrative which is logo- and Eurocentric, despite the importance he attributes to peripheral groups, such as women and minorities, in constituting more equal and autonomous relations (Delanty, 1997).

In his stimulating and imaginative use of a cybernetic approach, Loet Leydesdorff attempts to close a metaphysical divide constructed by Habermas between 'those who believe in "linguistically generated intersubjectivity"' and the adherents of "self-referentially closed systems"' (Leydesdorff, 2000, p. 280) and to elaborate on the integrative function of language which Habermas considers central for the development of communicative competence. He provides a valuable theoretical insight into the conditions that ensure the evolution of communication and the construction of knowledge through reflexive coding of communications. His theoretical perspective envisions a possibility for an observer/participant who can function simultaneously in the infra-reflexive (external observer) and hyper-reflexive (internal observer) modes. According to Leydesdorff, such dual functioning allows the observer/participant to establish correlatives between the two modes of observing. Differences between these modes open possibilities for a further development of the observer/participant as an autopoietic system and an enhancement of his or her communicative competence.

However, Leydesdorff's theoretical insights into the process of constructing knowledge do not resolve the paradox of observing. He does not indicate where in his theoretical vision, which allows only an observation of the observing on the preceding level of stabilization of an autopoietic system, one might find a position from which an act of one's own observation can be observed.

Leydesdorff's elaboration on the integrative function of language raises another important issue. Like Habermas, he does not make clear why he considers language to be in the privileged

position for resolving the problem of reflexivity. As a symbolic system, language regulates social interactions. But so do politics, economics, cultural and moral norms, and other symbolic systems. Just like any other system, language must have its own regulatory mechanism; in other words, it also requires a system that would stabilize linguistic operations and open possibilities for a further development of the autopoietic process. The regulatory mechanism of linguistic operations, which makes a reflection on these operations possible, in turn gives rise to its own regulatory mechanism, as a reflection on reflection. There is no reason to consider linguistic operations in any way superior to other symbolic systems. The fact that language can be used to explain the operation of a higher level systems testifies to the remarkable capacity of any lower level system (linguistic or not) to adapt to a higher-level one. Hence there is no reason to suppose that language can provide the ultimate regulatory mechanism which can permit reflection and control of the autopoietic process itself. On the contrary, as an instance of this process, language is embedded in it and therefore linguistic operations act recursively only on social interactions as the level which precedes them.

Humberto Maturana—a Chilean biologist who, together with Francisco Varela, is the creator of the theory of autopoiesis—offers a radically different perspective on the problem of observing. Similarly to anti-representationalists, Maturana maintains that it is impossible and unnecessary to talk about our knowledge as representing some objective reality. Knowledge, in his view, simply represents consensual statements which are valid only within the community of observers who produced them. In Maturana's words, 'science or the domain of scientific statements does not need an objective independent reality, nor does it reveal one' (Maturana, 1988, 4.ii.A).

Maturana derives his radical conclusion from his observations, as a neurophysiologist, of neural activity, which, in his view, lies at the core of knowledge production. Nervous systems, Maturana observes, 'are closed systems and, accordingly, do not offer means for the descrip-

tion of an objective reality' (Maturana, 1978, 55). Since, he argues, 'a closed neuronal network cannot discriminate between internally and externally triggered changes in relative neuronal activity', for the operation of the nervous system (an organism), there cannot be a distinction between illusions, hallucinations or perceptions (Maturana, 1978, 46). Therefore, he concludes, all knowledge, including scientific knowledge, is 'merely metaphorical and carries no explanatory value' (Maturana, 1978, 45). Maturana is unflinching in his epistemological relativism. Even his own theoretical views do not escape the radicalism of his conclusions:

... in the process of being a scientist explaining cognition as a biological phenomenon, I shall proceed without using the notion of objectivity to validate what I say, that is, I shall put objectivity in parenthesis. In other words, I shall go on using object language because this is the only language that we have (and can have), but although I shall use the experience of being in language as my starting point while I use language to explain cognition and language, I shall not claim that what I say is valid because there is an independent objective reality that validates it (Maturana, 1988, 5.ii).

The theory of autopoiesis has wide applications and is very important for our understanding of the production of knowledge. According to Maturana, the autopoietic system is a unity defined 'by relations that constitute it as a network of processes of production of components which: (a) recursively participate through their interactions in the generation and realization of the network of processes of production of components which produced them; and (b) constitute this network of processes of production of components as a unity in the space in which they (the components) exist by realizing its boundaries' (Maturana, 1974, 153). Maturana underscores the dynamic nature of the autopoietic system which conserves its autopoietic organization by reproducing it. Such reproduction of its organization enables the autopoietic system to evolve, or to produce itself, and the process by which it produces itself is the

autopoietic process. According to Maturana, production of knowledge is just one example of autopoiesis.

The conceptualization of cognition as a self-generating process is a very valuable insight. However, while helping us understand better the production of knowledge, Maturana denies it any objective validity. For him, there is no point from which an observer can observe the observing. Hence objective knowledge, for him, is in principle impossible.

Maturana's conclusion is problematic even in the context of his own theory. Maturana, for example, recognizes that autopoietic systems have plasticity and are capable of adaptation. Therefore, they are not entirely closed and are capable of knowing something—at least to the degree specified by their own self-referentiality—about the reality external to them. Indeed, Maturana sees that the autopoietic system is capable of transcending its own limitations through structural coupling. However, quite uncharacteristically, he offers no rational reasons for such transcendence and invokes the moral sentiment of love in his explanation of the impetus for it. Also, while one may be in agreement with the notion that symbolic operations ultimately originate in biological functioning of the organism, which is central to Maturana's theoretical perspective, one may be less convinced that the domains of psychological functions and symbolic operations do not have their own specific capacities and may be more open than the biological functions. Maturana's insistence on similarities between biological and cognitive autopoiesis does not prove that the degree of closure or openness of psychological and symbolic operations, which are regulatory in relation to the biological domain, is the same as in biological operations. Finally, if indeed biological functions give rise to psychological and symbolic operations, Maturana does not explain the presence of the notion of objectivity in human knowledge from a biological perspective.

Despite similarities between the positions on the problematic of observing between Maturana and Niklas Luhmann, the latter's treatment of this subject is more nuanced than Maturana's,

contrary to Leydesdorff's critique of Luhmann (Leydesdorff, 2000). Leydesdorff argues that Luhmann simply imported the biological model of Maturana into the field of sociology and that he 'is behaving as a super-observer who claims to be able to detach himself (like a biologist) from the meaning provided by the participants in the systems that he observes' (Leydesdorff, 2000, p. 278). Like Maturana, Luhmann is fully aware of self-referentiality of knowledge and that observation is a function of the observer as an autopoietic system (Luhmann, 1995). He understands that the circularity of observing is unavoidable but, unlike Maturana, he argues that it can be interrupted by introducing conditioning. Such conditioning is a proper function of reason, or rather reasons, as Luhmann puts it. He is perfectly aware that rationality is not a panacea. In his words, rational conditioning merely transforms 'the vicious circle into an infinite regress' since 'one must ask for the reasons behind the reasons' (Luhmann, 1995, p. 479). However, for Luhmann this infinite regress 'is fitted with hopes of approximating ever more closely to reality, which are finally anchored in functioning complexity' (Luhmann, 1995, p. 479). In Luhmann's view, an awareness of circularity of reason is the key to a normative practice for observing reality:

If one in turn justifies the reasons and keeps every step of this process open to critique and ready for revision, it becomes more improbable that such an edifice could have been constructed without reference to reality. The circularity is not eliminated. It is used, unfolded, de-tautologized. Without this fundamental self reference all knowledge would collapse (Luhmann, 1995, p. 479).

The first step in de-tautologizing of knowledge is to 'focus on social rather than psychic systems' since these 'can be psychologically deconditioned' (Luhmann, 1995, p. 484). Luhmann is fully aware that the shift to the social sphere does not solve the problem of reflexivity. As he writes:

Even the social systems of society and of science are only self-conditioning autopoietic systems of a special kind. They observe and

describe their own performance, and this does not sublate the relativity, in principle, of all observation and description to a system ... (Luhmann, 1995, p. 485).

His answer to the paradox of observing is not, as Leydesdorff thinks, in the absolutism of a super-observer. Rather, it is in a cautious reminder that 'questions of final justification can only be answered within the self-referential theories of self-referential systems' and in 'the logic of universalistic theories that forces them [theories] to test on themselves everything they determine about their object' (Luhmann, 1995, p. 485). The direction for resolving the paradox of observing pointed by Luhmann reveals modern sensitivity toward reflexivity, self-referentiality, recursivity and complexity. Yet it ultimately, too, is not a solution since Luhmann does not define the position from which one may be able to observe simultaneously the object and the process of observing.

THE DYNAMIC EQUILIBRIUM IN AUTOPOIESIS AND THE PROSPECTS FOR RESOLVING THE PARADOX OF OBSERVING

So the question remains: Is there a point from which one could regulate and reflect on the process of autopoiesis itself, not just a particular autopoietic system?

In order to answer this question, a closer look at the functioning of an autopoietic system is in order. One example of the functioning of autopoiesis is the development of intelligence in children. The remarkable study by Piaget *The Origin of Intelligence in Children* shows in great detail how reflective intelligence develops from sensory-motor operations (Piaget, 1998). For Piaget, the starting point in this development is reflex triggered by nerve signals. Neural functions regulate and act recursively upon physiological functions (for example, muscle contraction); signals from neurons trigger the exercise of physiological functions and thus help to conserve them. The more often this triggering

takes place, the more often physiological functions are exercised, the more stable they are.

Thus the need to conserve physiological functions creates the regulatory mechanism of the neural networks which acts recursively on these functions. The result is the development of sensory-motor functions which, in turn, also tend toward conservation. They conserve themselves in two ways. First, they become increasingly oriented toward external reality in search of stimulation. This process evolves from random groping to a more directed search for stimuli which leads to a gradual construction of the object on the level of sensory-motor operations (but not yet on the representational level). As the growing number of objects are incorporated into sensory-motor schemes (the operation which Piaget calls assimilation), the infant becomes increasingly orientated toward the exogenous sphere.

Second, sensory-motor operations conserve themselves through mutual assimilation (for example, tactile, audio, visual, gustatory, and other functions). One example of such mutual assimilation is an activation of audio functions by visual ones, and *vice versa* (e.g. infants begin to turn their head to catch the sight of the mother when they hear her voice). Mutual assimilations give rise to the construction of permanent mental representations. This process is completed at the beginning of the second year when infants begin to look for objects that are hidden from a direct view. The search for a hidden object signifies that an infant has already constructed a permanent mental image of the object.

Mental representations regulate sensory-motor operations and act recursively on them. The stabilization and conservation of mental representations also requires a regulatory mechanism which is provided by symbolic operations. The construction of symbolic operations is also a two-pronged process which involves mental operations and social interactions. There is a circular dependence between the conservation of mental representations and social relations. The conservation of mental structures requires interaction among individuals on a much broader scale than was possible or necessary prior to their emergence. As many thinkers (including Piaget

and Vygotsky) have argued, the development of mental structures is intimately related to the development of social relations (Piaget, 1965; Vygotskii, 1978; 1929). The creation of symbolic operations opens infinite possibilities in constructing symbolic autopoietic systems (linguistic, political, economic, legal, moral and value systems etc.).

The above description shows that the process of autopoiesis is sustained by two internally generated operations—conservation and regulation—which are dynamically interrelated. Autopoietic systems are closed systems, which conserve themselves through reproduction. Conservation requires stability. In order to stabilize themselves autopoietic systems require a mechanism of regulation which, as the above description shows, is generated internally. The better the regulatory mechanism performs its function, the better it handles perturbations, including potential perturbations, the more stable the system is and the better it is conserved. In order to perform its function, the regulatory mechanism also requires stabilization. The stabilization of regulatory operations, in turn, requires a regulatory mechanism which initially lacks stability. With the stabilization of the new mechanism, the system enters a new cycle of equilibration and destabilization which, in turn, requires re-equilibration. Thus the need to conserve the autopoietic system results in constructing new levels of regulation. Since there is no reason to suppose that at some level of stabilization the need for conservation will disappear, one must conclude that the construction of regulations of regulations will never cease.

Regulation is essentially a reflective operation. The infinite perspective on the autopoietic process may suggest, as it does to Luhmann, that there is really no way to reflect on the process of autopoiesis since for every reflective position there will always be a possibility of constructing another one. Every point of reflection can and will be succeeded by another one, no less embedded in the process of observing than its predecessor. Should one conclude, then, that the problem of the embedded observer cannot be resolved and all that is left is to rely on palliatives, such as Luhmann's conditioning?

It is logically correct to regard the autopoietic process itself as an autopoietic system. Just like any other autopoietic system, it requires stabilization and, therefore, regulation which offers a possibility of reflection. If autopoiesis requires regulation, there must exist a position from which one should be able to reflect on the entire process of autopoiesis.

As has been indicated earlier, conservation and regulation are at the heart of the process of autopoiesis. Conservation of functional operations requires regulation. In the initial stages of their development the regulatory mechanism is unstable. In order to acquire stability, it needs a regulatory mechanism of its own. As the new mechanism stabilizes itself, the autopoietic process enters a new cycle. Thus the process of autopoiesis involves constant oscillation between equilibrium and disequilibrium. Both equilibrium and disequilibrium are dynamically related in the evolution of autopoiesis. The repetition of the cycle eventually leads to the improvement of the function of regulation and the process of autopoiesis becomes increasingly more stable, despite constant changes. One can probably best describe this dynamic stability as homeorhesis—the term that was introduced by the biologist Conrad Waddington—rather than homeostasis. Homeorhesis is not a static condition but a stable equilibrium between equilibrium and disequilibrium. This dynamic balance has a function of regulation and, as a regulatory operation, offers a possibility of reflecting on the functioning of the system as a whole.

This paper has a limited goal. Its scope does not allow the full elaboration of the epistemology of observing the observing. It has merely argued that it is possible for an observer to reflect on the process of one's own autopoiesis and that the paradox of observing, which is at the core of the contemporary controversy in social sciences, can be resolved. The observer who observes the autopoietic process from the vantage point of the dynamic equilibrium between equilibrium and disequilibrium can observe and reflect upon every stage of the autopoietic process, including his or her own autopoiesis. Such reflective position offers a possibility to provide an

objective and empirically oriented reconstruction of isomorphic instantiations of the complex process of autopoietic construction of life forms, social systems, knowledge and beyond.

REFERENCES

- Appleby J, Hunt L, Jacob M. 1994. *Telling the Truth about History*. Norton: New York.
- Delanty G. 1997. Habermas and occidental rationalism: the politics of identity, social learning, and the cultural limits of moral universalism. *Sociological Theory* **15**: 30–59.
- Habermas J. 1979. *Communication and the Evolution of Society*. Beacon Press: Boston.
- Habermas J. 1985. *Theory of Communicative Action*. 2 Vols. Beacon Press: Boston.
- Jenkins K. 2000. A Postmodern reply to Perez Zagorin. *History and Theory* **39**: 181–200.
- Knodt E. 1995. *Forward in Social Systems, Niklas Luhmann*. Stanford University Press: Stanford.
- Leydesdorff L. 2000. Luhmann, Habermas and the theory of communication. *Systems Research and Behavioral Science* **17**: 273–288.
- Luhmann N. 1995. *Social Systems*. Stanford University Press: Stanford.
- Maturana H. 1974 [1999]. The organization of the living: a theory of the living organization. *International Journal of Human-Computer Studies* **51**: 149–168.
- Maturana H. 1978. Biology of language: the epistemology of reality. In *Psychology and Biology of Language and Thought: Essays in Honor of Eric Lenneberg*, Miller G, Lenneberg E (eds). Academic Press: New York.
- Maturana H. 1988. Ontology of Observing: The Biological Foundations of Self-Consciousness and the Physical Domain of Existence. <http://www.inteco.cl/biology/ontology/index.htm> [January 27, 2002].
- Novick Peter. 1999. *That Noble Dream: The "Objectivity Question" and the American Historical Profession*. Cambridge University Press: Cambridge.
- Piaget J. 1965. *The Moral Judgment of the Child*. The Free Press: New York.
- Piaget J. 1971. *Biology and Knowledge: An Essay on the Relations between Organic Regulations and Cognitive Processes*. The University of Chicago Press: Chicago.
- Piaget J. 1998. *The Origin of Intelligence in Children*. International Universities Press: Madison.
- Vygotskii L. 1978. *Mind in Society: The Development of Higher Psychological Processes*. Harvard University Press: Cambridge.
- Vygotsky L. 1929. http://www.marxists.org/archive/vygotsky/works/1929/cultural_development.htm [Sept. 24, 2004].
- Zagorin P. 1998. History, the referent, and narrative: reflection on postmodernism now. *History and Theory* **38**: 1–25.
- Zagorin P. 2000. Rejoinder to a postmodernist. *History and Theory* **39**: 201–209.