The Autopoiesis of Social Systems and its Criticisms

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Introduction

1 Systems theory is characterized by a broad conceptual openness and, simultaneously, by a constant discussion regarding the explanatory capacity of its observation tools (Rodríguez & Arnold 1991). This has had important consequences for the multidisciplinary character of its research. While this theory is framed within a research paradigm focused on “systems,” permanent examination of comparison points between perspectives of various kinds has become inevitable. Despite their different research praxes, the theories that deal with biological systems and those dedicated to the study of social systems have been intertwined on several occasions.

2 From a historical perspective, it can be noticed that is almost impossible to detach the concept of system from its social and biological roots. The (proto) systems theory of Herbert Spencer (1887, 1912) was a proposal that used the same principles to explain the evolution of biological and social systems. Half a century later, Ludwig von Bertalanffy (1950) insisted on developing a general systems theory based on the idea of open systems for biological and social sciences. Talcott Parsons (1951, 1961; Parsons & Shils 1962) also developed a theory of open systems focused both on social and on biological systems, to which he added the individual personality and the culture as analog systems.1 Based on these and other developments, not only sociology but also the vast field of interest of systems theory was nurtured. Not surprisingly, therefore, the concepts used and discussed in systems theory may have both biological and sociological explanations.

3 The concept of “autopoiesis” elaborated by Humberto Maturana and Francisco Varela (1980; Varela, Maturana & Uribe 1974) is an example of this. Designed initially under the umbrella of a theory of biological systems in order to explain the phenomenon of life, it was promptly adopted by the theory of social systems developed by Niklas Luhmann (1982a) to explain the self-constitutive character of social systems. The creators of the concept of autopoiesis insisted, however, on several occasions on the inadequacy of applying this term to social systems. This self-imposed restriction has been a subject of debate and controversy up to today.

4 In contrast to other concepts broadly shared by theories of biological and social systems, the concept of autopoiesis has sparked a sterile debate leading interdisciplinary research to an otherwise inexplicable underdevelopment. While systemic sociology has not only continued applying the concept, but also extended its use to diverse areas of the social, the biological theory of autopoiesis has tried, with great difficulty, to develop a social systems theory without

1 A broad overview of this tradition is in Rodríguez & Arnold (1991).
this concept. This cleavage has shown to be unproductive.

« 5 » In this article, we attempt to refo-
cus the debate on the concept of autopoiesis
for social systems research. We analyze not
only the benefits shown by this concept in
explaining social phenomena, but also the
consequences for social systems theory de-
erved from its restriction to a merely biological
level. In the first section, we discuss the concept of autopoiesis in the theory of social
systems, its relations with other concepts,
and applications. In the second section, we
address both criticism from the creators of
the concept of autopoiesis of its use on social
sciences and their proposal for a theory of
social systems. In the third section, we ad-
dress some criticisms from social sciences of
the use of the concept of autopoiesis. Finally,
we conclude with a diagnosis of the current
state of the debate and projections for this
perspective.

From self-reference
to autopoiesis of social
systems

« 6 » In the 1980s Luhmann adopted
the concept of “autopoiesis” along with the
development of a theory of “communication.”
Both are the result of a deepening of
the ideas of “self-reference” and “action,” on
which he had systematically worked since
the sixties. The article “Autopoiesis, action
and communicative understanding” (Luh-
mann 1982a) is the link between the two
stages of his theory. The concept of
communication, however, has a longer develop-
ment within his theory. Until his first major
theoretical synthesis in Social systems (Luh-
nmann 1995), which clearly outlines the cen-
trality of both concepts – communication
and autopoiesis – Luhmann always wavered
between a theory of social systems based on
actions and one based on communications:

“...We can speak of a ‘social system’ whenever the
actions of several persons are meaningfully inter-
related and are thus, in their very interconnected-
ness, marked off from an environment. As soon
as any communication whatsoever takes place
among individuals, social systems emerge.”
(Luhmann 1982c: 70)

« 7 » The link between both ideas – ac-
tion and communication – was given by the
concept of “selection.” Since “meaning” is the
unity of the difference between the “actual”
and the “possible” and every social system
is built on meaning, the social system itself
is a “selection” between different possibili-
ties that meaning offers (Luhmann 1982b).
Every social system builds its own borders
of meaning for itself based on processes of
“self-selection” (Luhmann 1982c: 70). Thus,
the difference between “system” and “envi-
ronment” was seen as a problem for the so-
cial system and its different ways of defining
an “inside” from an “outside.” Communication
and action constituted, in this theoretical
period, two manifestations of the same
process. Since social systems make visible
their own selections as actions – although
they arise as systems by means of commu-
nication – they must be treated as action
systems at the “empirical” level (Luhmann
opts for “communication” as the constitu-
te element of social systems, this empiri-
ical character of action only represents the
capacity of those systems to communicate
about themselves. The action is definitively
moved into the background: “the elemen-
tary unit, from which self-referential social
systems are formed, is not action, but com-
munication.” (Luhmann 1981b: 17). This
shift has important theoretical implications.

« 8 » Unlike general systems theory and
its concept of open systems (Bertalanffy
1950), Luhmann developed a theory of self-
referential systems, that is to say, “systems
that have the ability to establish relations
with themselves and to differentiate these
relations from relations with their environ-
ment” (Luhmann 1995: 13). Self-reference
stems from this dynamic character. Such
systems are not stable units that should
maintain this status, but dynamic units
composed of operations, i.e., systems differ-
entiated from an environment by means of
its own operations. Social systems are self-
referential since their units are constituted
from the difference with the environment,
which can be only obtained through opera-
tions of the system itself. Any exchange with
the environment must be based on system
operations and rejecting this conditioning
leads to dissolution of its constitutive differ-
ence.

« 9 » Luhmann (1995: 443ff) distin-
guishes three types of self-reference in social
systems. The “basal” self-reference indicates
the difference between element/relationship. This self-reference occurs at the level of the
operations of the system, i.e., communication.
The social system can only operate through
communication and uses communication
to define its borders with the environ-
ment. There are no system operations
that could be imported from the environ-
ment (Luhmann 2013b: 77), so the system
must jump-start its own operations and face
its own limits. Other types of self-reference
are “reflexivity,” i.e., the ability of communi-
cation to communicate about itself, and “re-
lection,” which considers the thematization
of the system within the system. The “basal”
self-reference, however, is the condition that
characterizes the autopoiesis of the system
(Luhmann 1982a: 369).

« 10 » Socio-autopoiesis means in this
context the ability of a self-referential sys-
tem to produce itself through communica-
tion (Luhmann 2012: 42), which implies
not only the differentiation of its elements
and relations, but also that the unit of the
system is obtained by means of its own op-

[1984]) is commonly pointed to as the definitive
threshold of his theoretical development. Nev-
ertheless, previously in 1981 Luhmann referred
briefly to the benefits of the term “autopoiesis” for
a theory of social systems. See Luhmann (1981a:
279f). Also in 1981, he opted for communication
as a central component of social systems. See Luh-
nmann (1981b).

3] Luhmann early noted the need to consid-
er “self-reference” as a necessary starting point for
interdisciplinary work. In an article published in
1983 as a revised version of a paper he presented
at a US conference in 1981, Luhmann writes: “Bi-
ologists with an interest in life, psychologists with
an interest in consciousness, sociologists with an
interest in social order, are at present and will per-
haps remain exceptions rather than the rule. But
they at least have to accept, despite many logical
and methodological warnings, types of theory
which imply self-reference. This leads to the con-
struction of self-referential objects and commits
them to seeing reality in terms of self-reference.”
(Luhmann 1983: 995)
A self-referential system is not only autonomous at the level of its structures, which means “self-organized” (Luhmann 2013b: 70ff), but it is also autonomous at the level of its operations – that is, “autopoietic” (Luhmann 2012: 33). Social operations are communications and they involve three “selections” of meaning: information, utterance, and understanding (Luhmann 1992). Therefore, communication is not a transmission of meaning between persons, but an operation of distinction by a self-referential system – Maturana and Varela (1987: 196) agreed on this.

Communication is the exclusive operation of social systems, which assumes human consciousness that irritates other human consciousness by means of language, human organisms that reproduce through their own operations, and environmental physical-chemical conditions that make all this possible. Nevertheless, the autopoiesis of society operates the autopoiesis of individuals or the psychic autopoiesis of consciousness at a different level from the organic level. Only communication produces communication, and this is the determinant social operation (Luhmann 1986).

This implies significant difficulties for a direct understanding of the concepts of communication and of the autopoiesis of social systems. The common understanding conceives communication as a tool for persons or animals to verbalize their thoughts or emotions, i.e., as a process of transmission (Shannon 1948) that is drivable through actions and intentions. This interpretation is based on a communication model that seems to fit well with everyday interactions in which we deal with neighbors, colleagues or friends through face-to-face relationships. On this image of a routinized life-world stands not only the mathematical theory of information but also sociological phenomenology, from Alfred Schutz (1972) to Jürgen Habermas (1987). Nevertheless, as constructivism and second-order cybernetics have pointed out, this everyday normality hides complex recursive networks, by means of which a reality is created (Foerster 1973). There is no direct relation between consciousness and communication, since each of these systems create independent realities and are reproduced through different operations.

Whoever wants to influence communication has to leave the recursivity of his consciousness to inform and give-to-know (utterance). In doing so, he or she loses the control of further operations, and forces the observer to choose a position as alter or as ego, and attribute experiences or actions. There is no turning back. In this context we can understand the controversial phrase of Luhmann: “only communication can communicate” (Luhmann 1992: 251). Whoever wants to communicate must submit him/herself to the selections of an autonomous system, whose operations involve further connections as well as other consciousnesses, who in turn may understand or not understand and inform and give-to-know. Social systems belong neither to alter nor ego, they are systems that define positions in the communication for alter and ego. Communication systems can create memory structures to resume a conversation in another moment; they can define roles, communicational limits, belongings or major symbolic generalizations. Communication does not enter into the consciousness and cells of persons to reproduce itself by chains of thoughts or metabolism, but creates its own autonomous relations network.

Luhmann’s application of autopoiesis moves the problem from the plane of the physical “space,” where life is constituted (Maturana & Varela 1980), to the “meaning,” where social systems emerge (Luhmann 1995: 59ff). Communication is not a spatial phenomenon but one of meaning: it could be irritated through sound waves, by characters on blank paper or electronic screens, or other spatial phenomena, but it emerges as the unit of information and utterance within the meaning of communication and not in space. The silent voice of our thoughts is a manifestation of this coupling between communication and consciousness, precisely because it is a voice that has no sound in an external space, but meaning in the consciousness. A communicated idea acquires meaning in the communication and one can keep thinking without interrupting communication. Both realms remain operationally separated but structurally coupled. Meaning, which is the medium of consciousness and communication, defines these two autopoietic systems.

There have been several applications of these ideas in sociological research. In the sociology of law, for example, an important tradition of studies on legal autopoiesis based on the ideas of Luhmann (2004) has been established. The jurist Gunther Teubner (1988) has made major contributions to this field and has developed an extensive research program on this topic. Other jurists, such as Marcelo Neves (2001), Karl-Heinz Ladeur (1999), and recently Andreas Philippopoulos-Mihalopoulos (2011), have followed the same path. They emphasize not only the self-referential character of law, but also its internal capacity as a communication system to produce its own elements: laws, rules, procedures, etc. This is one of the most developed fields in the theory of the autopoiesis of social systems proposed by Luhmann.

Economic sociology has also received inputs from this theory. Luhmann (1988) argues that the economy is an autopoietic communication system, whose fundamental operations are payments in money. This research program has been systematically followed by other scholars, such as Dirk Baecker (2006, 2008), who has researched the role of banks in a modern economy, and by Elena Esposito (2011), who has observed international financial markets as autopoietic systems. Many researchers, from both economic sociology and economics, have used the approach of the autopoiesis of social systems proposed by Luhmann.4

Sociology of art has also developed innovative research based on the concept of art as an autopoietic communication system (Luhmann 2000). This research includes literary studies (de Berg 2001), esthetics (Lehmann 2006; Nassehi 2011), painting (Valenzuela 2011), music (Araos 2006), and even architecture (Schumacher 2011).

Scholars such as Alois Hahn (1987), Peter Beyer (1985, 1997), and Stefan Nacke (2010) have also followed Luhmann in the sociology of religion (see Luhmann 1982d, 2002a), while in the field of the so-

4 For an overview of this matter, see Arnold & Cadenas (2013).
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(2012).

hierarchies, totalitarian orders” (ibid: 158).

some systems cannot be reproduced by all social systems can be autopoietic, since
and therefore all biological (living), systems have concluded that human “families” can be considered autopoietic systems defined by membership rules – and not by physical space. They even argue, “All autopoietic, and therefore all biological (living), systems are social systems” (Zeleny & Hufford 1992: 147), as they involve regular relationships between their components and thus “communication” between them (ibid: 157). Nevertheless, according to their conclusions, not all social systems can be autopoietic, since some systems cannot be reproduced by themselves. Such systems are “designed” by others and, therefore, are not spontaneous; they are joined by force, as with, for example, “concentration camps, jails, command hierarchies, totalitarian orders” (ibid: 158).

Systemic family therapy has also been influenced by the biological concept of autopoiesis (cf. Keeney 1983).

At this point, it becomes clear that the concept of autopoiesis has broad repercussions, not only in social systems theory but also in other theories, research, and disciplines. Notwithstanding the above, we argue that the theory of autopoiesis can only expand its horizons beyond the biological model if a theory of social systems based on communication is adopted. Discussions concerning the applicability of this concept to social sciences have not led to productive results and the debate has stagnated. This situation must be addressed in all its complexity. The autopoiesis of social systems has aroused controversies, not only in biology but also in sociological discussions. We will address some of this criticism in both fields and try to contextualize its depth.

We refer henceforth to critical positions regarding the application of the concept of autopoiesis to social sciences. We address this criticism on two fronts. On the one hand, we address biological criticisms, especially those made by Maturana and Varela. Along with these criticisms, and as a complementary point of view, we discuss sociological objections to the adoption of this concept made by Danilo Zolo and Jürgen Habermas.

Biological criticisms

Before Luhmann adopted the concept of autopoiesis, Maturana and Varela had already objected to its application to social systems. Varela (1981: 38) argued early that intentions such as those of Stafford Beer (1980) of applying the concept to organizations or of Gordon Pask (1978), who postulated conversations as autopoietic systems, were inadequate since such systems do not “produce” elements but only “operationalize” relations. His suggestion for the study of social systems was to focus the analysis in terms of self-reference and autonomy, otherwise “the notion of autopoiesis becomes a metaphor and loses its power” (Varela 1981: 38). Not only Varela, but also Maturana (1985: 53) and John Mingers (2002: 291) share the criticism of the use of the term “production.” This is due to their particular vision of social systems.

This blockade raised by Maturana and Varela was deepened later by their own theory of social systems, derived from their biological explanations of autopoiesis. The central argument of Maturana and Varela (1987) on this matter is that only biological systems of the first and second order are autopoietic, and social systems are mere aggregates of the third order of those systems. With regard to human beings, their social systems would be composed of individuals and their communicative and linguistic recursions. For them, social systems are both a social and biological phenomenon (Maturana 1985, 1997).

If the principles of this approach are followed, undoubtedly, social systems cannot be autopoietic, since they consist of “members of a group of living beings” (Maturana 1985: 58) or of “real persons” (Mingers 2002: 292), whose regular interactions lead to structural couplings, such as language. Based on these principles, the social cannot even be distinguished as a system, but only as a more or less defined set of interactions between organisms integrated by “love”; and if this disappears, this unit disintegrates (Maturana 1985: 67).

At this point, Maturana and Varela’s arguments exhibit their main weaknesses. While their ideas concerning biological phenomenon are supported by sophisticated systemic and cybernetic approaches, their conception of social systems, on the other hand, is based on old and outdated paradigms. This partly explains the fact that most sociological research on social systems has not followed this path. Another reason is, undoubtedly, the inexplicable and express renunciation of sociological knowledge (Maturana 1985: 54). With regard to this, Maturana (1991: 93) even argues that “the social does not belong to sociology, it belongs to everyday life, and sociology makes sense only as an explanatory attempt of everyday life.” However, in terms of his contribution to understanding the social phenomenon, there is no qualitative improvement of current sociological knowledge. In a way, it is more a regression. Maturana and Varela’s advanced conception of biological systems has a minimum impact on their notion of social systems. For such systems, the ancient Aristotelian paradigm of a whole composed of parts seems to be enough.

From a sociological point of view, this approach is more a “middle-range theory” (Merton 1949), in the context of systems theory, since its applications are of a distinctly particularistic nature. This is expressed in four main areas.

First, instead of problematizing complex social systems, this theory focusses on social groups – such as families that communicate through love, or populations in a space – which are mediated by in-person relationships; but it has no application in a broad range of social phenomena that do not fit this condition. At least by Émile Durkheim (1893), and with greater sophistication in Parsons (1961), the question of absence in social systems is problematized. Parsons (1961: 30ff), for example, contemplated the function of “latency” or “pattern maintenance” in a social system, making it an independent-acting unit. Another self-imposed blockade of Maturana and Varela’s

5] For an overview of the applications of Luhmann’s sociological theory, see Jahraus et al. (2012).
approach is the exclusion of economic relations from society, since these would negatively affect cooperation in a social group (Maturana 1985: 66). It is not necessary to refer to Karl Marx to discuss this postulate and see how narrow this vision of the economic and the social is, it is enough to remember the results of the well-known Hawthorne experiments of the 1930s, directed by Elton Mayo, on social factors of cooperation in industrial work (cf. Roethlisberger & Dickson 1939).

"30" Second, this theory definitively rejects giving a universalistic relevancy to social systems, since those refer only to groups that form and disappear through relationships of cooperation and love.

"31" Denying this relationship undermines human social phenomenon, because it refuses its foundations (love), and every society that does this disintegrates, even if its former members must continue interacting because they cannot be physically separated.59 (Maturana 1985: 65)

"32" For Maturana, unlike the old sociological tradition, which is rich in research on passing interactions (cf. Goffman 1983), such passing relations are not themselves social. This has not only left a broad range of social phenomena unattended, but also shows a narrow understanding of the phenomenon itself.

"33" Third, Maturana & Varela (1987) propose a utilitarian concept of social systems that remains subordinated to the maintenance of life. From their biological perspective, the social system is a structural coupling that makes possible the ontogenetic and phylogenetic continuity of human beings. The existence and continuity of such social systems is subordinated to the goals established by their parts (individuals), either individually or collectively. The social appears as a mere instrument for maintaining human life. The reasons for the insistence on subsuming social systems to the needs of their parts (individuals, persons) are not theoretically entirely justified and the authors seem to defend them by rather "ethical" principles (Maturana 1985: 70; Maturana & Varela 1987: 198). From an ethical point of view, one cannot disagree with ideas that highlight that death and totalitarianism are a consequence of political subjugation of individuals to society, but that is not an answer to theoretical questions.

"34" These four elements are a direct consequence of subsuming the explanation of the social phenomenon to the biological and of sustaining a vague sociological and anthropological view of social systems, i.e., as groups of individuals that are only social when cooperation or love occurs.

"35" Followers of Maturana and Varela such as Urrestarazu (2014) adopt a similar criterion. Urrestarazu’s social systems concept seems to go no further than that of Maturana and Varela. He insists on the part-whole paradigm and on the "interpersonal" character of a social system.

"36" Even if we accept that biology, as proposed by Maturana, also includes interaction processes between living beings, none of this excuses this approach for its adoption of a diffuse theory of groups and for stepping back towards an Aristotelian systemic thinking – that of systems as units composed of parts. There is an evident theoretical disconnection between social systems theory and that of biological systems. This leads to unproductive efforts, such as rediscovering many traditional sociological concepts, such as that of "role," without deepening, discussing or problematizing their sociological common sense. Thus for example Maturana says:

"37" If, instead, a less pretentious approach is chosen and the application of this theory is restricted to the field of building and maintaining social groups – including its belonging relationships and interactions – a common ground between both system theories can be founded. For this, however, the concept of society as a group must be abandoned, and to understand the place and relevancy of groups, the “levels” of differentiation of social systems must be analyzed (Luhmann 1982c).

"38" As we have seen, if we try to apply the theoretical principles of Maturana and Varela to a more complex social systems theory, huge explanatory problems arise. The amount and density of social phenomena that fail to be explained by this theory are so extensive that it becomes necessary to limit these ideas to a very specific set of phenomena.

"39" Thus, the objection of Maturana and Varela to applying the concept of auto-poiesis to social phenomena is partly due to the lack of an appropriate concept of social

http://www.univie.ac.at/constructivism/journal/no/2/169.cadenas
systems. The fact that social systems do not have clear spatial borders, in contrast to living organisms, does not imply that they are more “metaphorical” than other systems for an observer. If, however, the part-whole paradigm is abandoned and a theory of autopoietic social systems is developed in its place, a very different set of questions is opened and a new flank of criticism appears. We will try to answer these questions in the following section.

Sociological criticisms

Sociology has reacted to the concept of autopoiesis with some skepticism. One of the major criticisms is the “conservative” character that this concept would have. The accusation is certainly old, and it is not related solely to this concept but to the full theoretical architecture. The theoretical di-aspora of this criticisms is broad, it includes a philosophy with historicist accents, as in Danilo Zolo (1990), critical Marxist positions (suffice here only to mention Habermas), postmodern Marxism such as that of Fredric Jameson (2002), various revivals of Max Weber’s culturalism, as by Wolfgang Schluchter or Dirk Käsler (cf. de Marinis 2008), and other actionalist theories, partially inspired in the ideas of Luhmann (Knorr-Cetina 1992; Tyrell 1978; Wagner 1997). Since a complete analysis of these criticisms exceeds our ambitions; we will focus on those directly related to the concept of autopoiesis.

Zolo tried to deconstruct the theory of autopoiesis of Maturana and Varela from a philosophical point of view. His criticism hits the mark in some weak points of this theory, for example on the contradiction between a declared constructivism and a notion of autopoiesis based on the idea of “real” spaces (Zolo 1995: 219ff). However, Zolo seems to be unacquainted with the practice of concept building for scientific observation and experimentation. His criticism of autopoiesis as a scientific concept is an example of this. Since autopoiesis is only a “concept” describing a reality, Maturana and Varela would be victims of a “gnoseologic realism,” which tries to discover principles in nature (Zolo 1995: 219f).

Zolo certainly has no qualms about labeling Maturana and Varela with various philosophical affiliations. The main problem with this type of argumentation is that it cannot avoid being judged on its own principles or, better said, it cannot avoid being a self-referential criticism: is a “metaphysics” of scientific concepts able to be attacked, since it can only by criticized by means of concepts – as Zolo does? If we consider science as a communication system, this criticism is unproductive. Zolo’s arguments against Maturana and Varela finally lead to the historical charge that these authors have the historical “prejudices” of their scientific community (Zolo 1995: 229), and are influenced by their Chilean-Hispanic-Christian cultural tradition.

Criticism of the theory of autopoiesis of Luhmann, meanwhile, has a more political accent. According to Zolo (1995: 207f), this hides “neoconservative” proposals, especially on political, economic, and legal deregulation. This opinion is also shared by Jameson (2002: 92), although the latter bases his criticism on the ancient – but indefatigable – concept of “ideology,” in the context of an unduly historical-sociological analysis into which Luhmann’s theory (and sociology in general) is inserted. Neither Zolo nor Jameson seem to delve into the theoretical implications of this observation.

Jameson decided to choose the easier way, and instead of following a theoretical argumentation, his proposal is stylized as a complaint against any position that denies a postmodern rupture with the modern and, therefore, defends the modern. This, of course, ignores the multiple problems that Luhmann himself repeatedly noted regarding the disconnected and uncontrolled character of modern society, especially in the modern monetary economy (Luhmann 1995: 383ff, 2013a: 107ff, 1997 passim). (Zolo 1995: 242), for his part, files the same charges against Luhmann that he earlier directed against Maturana and Varela, that is to say, that the autopoiesis of social systems would be mere “realistic metaphysics.” Instead, Zolo proposes following an open systems theory, which consider inputs and outputs of the environment and suggests abandoning an approach that has not been consolidated, such as the theory of the autopoiesis and its conservative consequences. Zolo’s position involves a rejection of biological or sociological constructivism and a defense of traditional philosophy. The question of the theoretical advantages of distinguishing theories as conservative or liberal remains completely open, as well as that of the need for using this distinction scheme.

Habermas, for his part, made a number of criticisms of Luhmann’s approach, as a result of decades of debate. Habermas considers this sociological theory of autopoietic systems as heir to the philosophical tradition of the “subject.” However, for him, this theory cannot be considered metaphysical but “metabiological” (Habermas 1998: 384) noted that Luhmann’s biggest mistake consists of separating social and human phenomena. However, unlike them, Habermas argues that this mistake is not the separation of the biological from the social, but the dissociation between psychic and social systems. The link between the two is language, which makes understanding and consensus among people possible. According to his approach, objects in the world are such only insofar they are represented, that is to say, “As states of affairs expressed in sentences” (Habermas 1996: 11). This supposes that thoughts are propositionally structured and the structure of sentences would allow the structure of thoughts to be read. On the other hand, social systems are only one side of social phenomena; the other side is the “lifeworld” (Habermas 1976, 1987), which does not follow the same principles of social systems, but rather linguistic mechanisms, aimed at understanding and consensus. Autopoietic social systems operate “narcis-sistically” (Habermas 1996: 51), taking into account only their own determinations.

In addition, unlike Maturana and Varela, Habermas proposes a theory of society that does not restrict the social to a “lifeworld” based on cooperation and consensus, but considers – following David
Lockwood (1964) – two principles of integration, namely social and system integration. Society is system and lifeworld. This duality comes from Habermas’s (1976: 5f) peculiar interpretation of Parsons’ AGIL action model (Parsons, Bales & Shils 1953), whereby only the spheres of politics and economics (A-G) are systemic, while institutions of social integration and culture (I-L) have a non-systemic nature.

Unlike Maturana and Varela, Habermas postulates a two-level theory of society. Society is not only a human life-world based on cooperation and consensus, but also a system. Following Lockwood (1964), Habermas noted that society has two integration principles, namely, social and system integration. While the expansion of this paradigm for social research has proved fruitful, the greatest strides of this approach have been made in the field of political philosophy, notably in the debates between him and John Rawls (1998), as well as in the interdisciplinary field of communication theory.

Conclusion

We began our remarks by highlighting the schism between biological and social theories of autopoiesis, and we stressed the need to address this concept in a unified way. Our motivation comes not from a sociological whim to subjugate the biological theory of autopoiesis to the social, but from systems theory’s original purpose of unifying science.

Systems theory, since the “general” programmatic formulation of Ludwig von Bertalanffy (1950), has used the concept of “system” as a common ground for varied disciplines. The cybernetics of Norbert Wiener (1948) also described itself as a science of information of various types of systems, such as machines and living beings. The main problem was not the obvious fact that each system is different, but rather the explanatory capacity of the model in each one of them, and to this task, both von Bertalanffy and Wiener devoted all their efforts. The first theories of social systems, such as those of Parsons (1951, 1961; Parsons & Shils 1962) or Buckley (1967), also considered general models applicable to different phenomena.

The same principles that have guided systems theory from its beginnings can also be applied to the theory of autopoiesis. This involves, undoubtedly, redirecting the theory to its original spirit and avoiding a split into different contents or disciplines. As noted by Zeleny and Hufford regarding the concept of autopoiesis:

Thus it does not matter what the things are in the system only that whatever they are they produce themselves. The autopoietic nature of a system is within the domain of systems science, systemhood, since it is independent of the things, thinghood, in the system.” (Zeleny & Hufford 1992: 146)

This, of course, involves abandoning the idea that the theory of autopoiesis of social systems can be only used in a “metaphorical” or “analogical” sense. Instead of this, it seems appropriate to follow the advice of Rudolf Stichweh (1987: 447) of applying this concept through a controlled relation between “generalization” regarding its biological context and “respecification” concerning social systems.

If a formal principle is adopted, according to which autopoiesis refers to op-
Open Peer Commentaries on Hugo Cadenas & Marcelo Arnold’s “The Autopoiesis of Social Systems and its Criticisms”

What Is Sociology?
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> Upshot • I discuss the foundations of what I have said in my work as a biologist on autopoiesis, molecular autopoietic systems and social systems. I argue that the theme of sociology should be to understand how it is that we come out of the social manner of living that is the foundation of our origin as languaging and reflecting human beings.

> 1 • I am writing this commentary because the contents of Hugo Cadenas & Marcelo Arnold’s target article and its title evoke a criticism of what I have written about living systems and about social systems. I find that the article is misleading because it does not represent what I have said in my writings. For these reasons I want to reflect on sociology in detail here. This links in particular to the Results and Implications in Cadenas and Arnold’s abstract.

> 2 • As a biologist, my purpose has been and is to describe, explain and understand biological phenomena as I see them happening in the realization of the living of at least one living being as they appear to me as aspects of my daily living from one morning to the next in whatever domain of doings I may find myself.

> 3 • Accordingly, in what follows I present my reflections standing on a reflective ground defined by three basic unavoidable biological facts:

- The first basic biological fact is that, like all living beings, do not know and cannot know that which we, calling valid at any particular moment in the experience of what we live, shall devalue later as a mistake or illusion or shall confirm as a perception when we compare it with another experience, the validity of which we choose not to doubt.

- To accept this first basic biological fact leads me to accept the second basic biological fact: We cannot claim to be able to say anything about anything that we distinguish had any property or feature independent of what we were doing in the moment that we distinguish it.

- The third basic biological fact is that living beings as molecular entities are structure-determined systems. As such, anything that is external to a living system and that impinges upon it cannot specify what happens in it, and only triggers in it some structural change determined in its structure according how it is made at that moment. As a result of this third biological fact, whenever two or more living beings participate in a dynamics of recursive interactions, they enter in a process of coherent transformation, which I have called “structural coupling” (Maturana 1978). It gives rise to ontogenic and phylogenic evolutionary histories of congruent structural and behavioral transformations between the organisms and their ecological niches that arise with them. These histories last until the organisms separate.

> 4 • All this happens spontaneously in the biological domain, and all this constitutes the foundation of all that we do in...
our living as biological-cultural human beings from one morning to the next, whatever we may be doing, thinking, desiring or reflecting. Therefore, I shall take our daily living as the operational and epistemological grounding of all that we human beings can say and that I shall say as I describe and explain my understanding of living systems and of the operation of what we call “social systems” in our daily living in our cultural present. I begun to think, speak and act in this understanding in 1965, when as a result of my work on color vision (Maturana, Uribe & Frenk 1968) I came to realize that which I described above as the first biological fact.

“5” From this reflective starting point, I, together with Francisco Varela, referred to a living system as a molecular autopoietic system (Maturana & Varela 1973). The word autopoiesis was proposed to indicate and evoke a closed network of recursive processes of production of the molecular components of a system that specifies its borders in its operation as a discrete entity in the relational space in which it exists as a totality. Thus, when we first referred to living systems as “autopoietic systems,” we were claiming that they existed as networks of molecular productions that were closed in the sense that they produced their own borders determining their extension as discrete entities. However, at the same time they are open to the flow of molecules through them. It seems to me that this was well understood by Niklas Luhmann but that he wished to use the notion of autopoiesis in an operational domain different from the molecular one, as is apparent in his proposition that “social systems were autopoietic systems of communications.” When we talked in 1991, I pointed out to him that the notion of autopoiesis does not apply in the way that he wanted because communications do not interact and thereby produce communications like molecules. I asked him why he leaves human beings out of his proposition, knowing that human beings are the foundation of human social systems and that what we call “communications” occur as a reflective operation of human beings in conversations about what they do. He replied that he wanted to propose a predictive theory of social phenomena, and that human beings were unpredictable in their behavior. So I told him that I did not want to propose a sociological theory, especially if the theory would leave out human beings as he proposed. Rather, I wanted to understand the spontaneity of the operation of those communities of living beings of any kind that in our daily life in our culture we would call “societies” or “social systems.”

“6” The word “social” and the expression “social system” were used in daily life to refer to some manner of living together of organisms already long before Varela and I proposed the notion of autopoiesis to speak of the molecular constitution of living systems as discrete entities. In the domains of biology and of our daily life, many different words were used and are still used to refer to the distinctions that we make between the different manners of living together that the different kinds of organisms may adopt. For example, we speak of symbiosis, parasitism, social systems, commensalism and communities. What kinds of things are we distinguishing with such different names?

“7” We human beings propose theories as systems of explanation of what we distinguish as happening in what we observe or do in the realization of our living. Theories are systems of logical deductions that we propose in order to follow the consequences that would arise in a particular situation if we transformed everything in it around the conservation of some set of basic premises that we choose to adopt – either because we accept their validity according to some logical argument or, a priori, because we like them. Yet, we cannot properly make a theory before having some notion of what characterizes the kind of systems or situations that we may be considering while everything else is changing around the basic premises that we think define the theory and that we have chosen to conserve.

“8” Accordingly, I want to ask the question: What do we wish to mean with the word “social”? More precisely, I want to address the common features that those systems that we call “social” in our daily living have in common – systems that we wish to conserve while everything else is allowed to change around them as we operate with the theory that we are proposing in order to understand the manner of operating that is evoked when we speak about those manners of living in human or in insect communities that we call social systems.

Social systems?

“9” If we attend to the different kinds of manners of coexistence that we may observe in living systems, we will see that they differ in the nature of the biological processes that keep them near each other in the different degrees of closeness or of distance as they happen to come together. Expressions such as “multi-cellular,” “symbiosis,” “commensalism,” “parasitism,” “colonies” and “social systems” are used to distinguish those different classes or forms of nearness. And we know also that those different forms of living in nearness or distance entail different inner feelings and different relational doings and emotions. Furthermore, in our daily living we act as if we are aware that not all human relations are of the same kind, and that their nature as different manners of relating and of closeness depends precisely on the inner feelings and emotions that define them. Thus we speak of relations of work, authority, domination, subordination, alliances, etc. and we know that they differ from collaboration, friendship, etc. in the inner feelings that, as I just said, define them. Accordingly, this is why I have claimed that not all human relations are social relations. Rather, the inner feelings, emotions and doings that constitute social relations are those of mutual care, collaboration, honesty, equity and ethics, not as declared values, but as spontaneous manners of relating that result from our biological constitution as basically loving beings. Furthermore, we human beings can also consciously choose to adopt explicitly those manners of relating in our living together that we call democracy.1 Yes, as reflective language beings we human beings can negate and reject, support and approve our feelings, emotions and doings, being consciously or unconsciously guided by some theory of our choice that we may have adopted according to what we may want or not want to do.

1 | Ximena Dávila Yáñez and I claim that there are five manners of relating, which we intentionally adopt for living together, that constitute what we want to be the case when we declare that we want to live in democracy. These are: mutual respect, honesty, collaboration, equity and ethics (Maturana & Dávila, in press).
As I just said above, that which we call “social” in our daily living in our cultural present is our spontaneous biological coexistence in relations of mutual care and collaboration that are sustained by inner feelings of love. If we accept our understanding that the biological nature of social phenomena is collaboration in mutual care, what do we need a sociological theory for? What are our concerns that we feel that we need a special sociological theory to speak of our spontaneous biological living in mutual care and collaboration under the inner feelings of love? Let us reflect.

Individuals?

The basic statement that love is the emotion that constitutes social relations was made in Maturana (1985). The following reflections have been developed by Ximena Dávila Yández and me during our work together over the last fifteen years in Escuela Matríztica de Santiago. This is why in what follows what 1 write is the product of us both, and “we” refers to her and me.

We may say that an organism acts as an autonomous individual when we think that it does what it is doing without emotional contradiction in the pleasure of doing what it is doing, whatever it may be. In the case of those insects that we call social insects, the manner of living together occurs in the doings of each member of the community as a spontaneous result of its individual growth in the nurturing circumstances of the care given to it by the older members of the community that it integrates with them as they act themselves as autonomous individuals. This manner of living is the evolutionary result of a history of conservation of the mother-offspring relation of care prolonged in the ontogeny of each insect and conserved from one generation to the next in their historical coexistence in communities that became extended networks of collaborative mutual upbringing in mutual care. This collaborative mutual upbringing and care was established and is sustained by a flow of hormones, neuropeptides, nutrients and many other kinds of molecules that act in the process of growth and cellular differentiation of each insect through an interchange of food. At every instant and circumstance, it determines in each of the insects the course followed by the physiological and anatomical changes that the insect may be undergoing at that instant-circumstance according to its participation in the realization of the dynamic architecture of the social community that it integrates at that instant. Nothing that an observer could call a plan, blue print, purpose or aim is involved in this process. In other words, every organism member of the community does what it does at every moment according to its structure or dynamic architecture as it is arising according to its present participation in it. This particular manner of generating and conserving instant after instant the sensory, operational and relational coherences in a community of social insects through a food interchange that continuously results in the realization of the adequate dynamic architecture of each insect and of the social community at every instant is called tropholaxis.

An insect becomes a member of the social community to which it belongs, as it grows in it as an individual that participates in a recursive fashion in its realization and its conservation, through caring for the growth of other individuals in the same manner that it was cared for. Is what occurs with social insects very different from what occurs in the human communities that we call “societies” or “social systems” to which we belong? No, and at the same time, yes. No, what happens with social human beings is not very different from what happens with social insects in the sense that in both cases a “social system or social community” is generated and conserved through relations of collaboration and mutual care that arise in the evolutionary expansion of the mother-offspring love relation. But, yes, it is very different because what happens with social insects is a living in spontaneous collaboration in mutual care sustained as a dynamic loving relation through a network of interchange of hormones, neuropeptides and nutrients; while the mutual care that realizes and conserves us as social human being members of the social community or social system into which we may integrate arises in the expansion of the mother–child relation of loving care for the whole life. This care relation arises as the continuous result of living in the recursive flow of coordination of feelings, doings and emotions in the creation together of the worlds of daily living that they generate as they live as language and reflective beings in networks of conversations, through a languaging process that we, Dávila and I, call “logolaxis.”

Logolaxis is the flow of the networks of conversations that in us human beings play the same role as tropholaxis in insects for the generation and conservation of the harmony of the acting dynamic architecture of the individual organisms and the social and non-social systems and communities into which they integrate at any moment of their living. That is, we reflective human beings live the networks of our conscious and unconscious coordinations of inner feelings, doings and emotions in a logolaxis of mutual care and collaboration that constitutes our body and “soul” as loving social beings. So, the networks of conversations through which we generate and realize the worlds that we live as human beings coordinate and guide unconsciously the course of the continuously occurring anatomo-physiological transformation of the dynamic architecture of the ecological organism–niche unity of our social and non-social living, depending on the inner feelings, doings and emotions that guide us in all that we do while our living lasts.

We are usually not aware of the extent to which our inner feelings and emotions that guide the nature of our doings in the networks of conversations that constitute the realization of our living guide the course of the continuous transformation of our anatomy and physiology according to the living that we are living. In social insects, tropholaxis guides the forms of living that are basically conservative in that they appear to repeat from community to community within each species that we recognize precisely due to such repetition. In humans, logolaxis can in principle exhibit unlimited variation. Humans can generate an open-end
ended diversity of networks of conversations, which may be changing continuously. This diversity of conversations in our human existence — our social conversations as conversations of mutual care and collaboration under the inner feelings of love — makes our existence possible as the evolutionary result of conserving the conversations through our children’s learning from one generation to the next. This has been the case since the origin of our living in language in a family of bipedal primates, i.e., for at least some three million years in the mutual care of sharing food in the loving tenderness of sexual intimacy.

Sociology?

« 16 » The different kinds of social insects occur as different manners of living together in mutual care that occur in the same manner in the different communities of each species because the kinds of individuals that compose them repeat through their manner of upbringing and their participation through tropholaxis in the generation of their behavior as individual organisms. All this makes the behavior of the individual members of any particular insect social community essentially predictable, easily replacing each other in their operation in the social community because they are basically similar. Contrariwise, our manner of living as languaging and reflective human beings that learn the particular form of living together in the loving mutual care of the social community in which they grow in logolaxis may be different in the different kinds of social living that we may generate in our cultural-biological existence. We human beings as reflective language beings live in a continuous openness to live in different manners our individual lives through reflections in which we can always ask ourselves if we want to do or think what we are doing or thinking. Also, if we dare to do that, we can also always look at our inner feelings, doings and emotioning, and change them through our reflections in the knowledge that our bodyhood will also change accordingly.

What about our molecular autopoiesis?

« 17 » Our human anatomy and physiology occur in the realization of our molecular autopoiesis in the ecological organism-niche unity that we integrate; yet our humanness as persons that exist as totalities operating as social beings interacting with each other happens in the relational space. And we, as we speak about ourselves, exist in the relational doings of a reflective conversation as persons that explain the nature of their existence as observers to other persons that listen as observers too. Whenever we reflect, whenever some elements form a totality through their interactions, an intrinsically new sensory, operational and relational domain arises that could not have been deduced from what was before. It is because new sensory, operational and relational domains appear in our living from our doings, from the independent happenings that occur in our ecological niche unity, and from the new domains that arise in our reflections in a manner that cannot be deduced from what was happening to us before, that it is intrinsically impossible to create a predictive theory in relation to what will happen in the course of our social living as we operate in it according to our desires. If we want predictive behavior in a human domain, we must agree on a common project, or submit, either unwillingly or willingly, to some tyranny.

What is sociology?

« 18 » I feel that I do not fully understand what is the actual concern of sociologists as they do their sociological reflections; I also feel as a biologist that if I were to declare myself a sociologist my concern would be to understand how can we contribute as human social beings to overcoming our fundamental addiction to the pleasure of being satisfied and to recovering the pleasure of mutual respect, collaboration honesty, equity and ethical social living. Furthermore, as a result of our reflections on tropholaxis and logolaxis, Dávila and I think that if we were to declare ourselves sociologists, our concern as such would be to understand the origin of the rational-emotional contradiction that has interfered with the conservation of the basic harmony of our social existence in the loving relation of collaboration and mutual care that was the ecological organism-niche unity in which we arose as languaging and reflecting human beings.

« 19 » In other words, if social beingness appears spontaneously in our biological history as a manner of living together in recursive mutual care as a result the expansion of mother-offspring care, then the theme of sociology cannot be to understand the nature of the social phenomenon. This is because we know that when we speak about social systems, we are speaking about sensory, operational and relational biological communities of organisms that live in collaboration and recursive mutual care. The theme of sociology should be to understand how is it that we come out of the social manner of living that is the foundation of our origin as languaging and reflecting human beings.

« 20 » How was it possible and is it still possible in our human social history that we have repeatedly fallen and we are still repeatedly falling out of our social beingness, even though we are aware and know that our social beingness is the basic foundation of our humanness?

Humberto Maturana Romesín received a Ph.D. in Biology from Harvard University. He showed that living beings are molecular autopoietic systems, and that if one follows the consequences of the fact that living beings do not distinguish in their experience between perception and illusion, one can show that: language as a biological phenomenon occurs as a flow of living together in coordinations of coordinations of consensual behaviors, and cognition as a biological phenomenon occurs when an organism operates adequately to the circumstances of its living, conserving its autopoiesis as a consequence of the operational-relational coherences with its niche that are proper to it in the present of its living as a feature of the history of the evolutionary structural drift to which it belongs.

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Towards a Consistent Constructivist General Systems Theory

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> Upshot: Cadenas and Arnold contribute towards a better understanding of what is at stake in the long debate concerning the applicability of Maturana’s autopoiesis concept to social systems. However, their target article has two shortcomings: (i) it does not provide a deeper understanding of the reasons why Luhmann’s adoption of the autopoiesis concept has proved to be sterile after decades of debate, and (2) their historic account does not integrate recent developments that need to be highlighted to improve interdisciplinary research.

Introduction

1 Hugo Cadenas and Marcelo Arnold’s paper provides both a succinct historical account of the critical points involved in the above-mentioned debate and a synthetic description of the still unresolved problematic issues. Their main concern is to propose a path for “promoting the development of new interdisciplinary research in the field of systems theory and constructivism” (Abstract: Implications) by examining the criticisms, obstacles, and shortcomings arisen from Luhmann’s intent to apply autopoiesis to his social systems theory through “moving” “[...] the problem from the plane of the physical ‘space,’ where life is constituted (Maturana & Varela), to the ‘meaning’ [domain], where social systems emerge (Luhmann)” (§14).

2 Whilst enthusiastically sharing the above-mentioned concern and agreeing with their methodology of “[...] theoretical reconstruction of the main issues of the debate” (Abstract: Method), I cannot avoid critically commenting on their account of the “adoption” procedure of the concept of autopoiesis by Luhmann and on some omissions in their proposed history of the debate.

3 Cadenas & Arnold acknowledge that “Luhmann adopted the concept of ‘autopoiesis’ along with the development of a theory of ‘communication’” (§5, my emphasis) – on his own – and at the same time they regret that “the term autopoiesis has sparked a sterile debate leading interdisciplinary research to an otherwise inexplicable under-development” (§4, my emphasis).

4 Their target article has two shortcomings, though. Firstly, it does not provide a deeper understanding of the reasons why Luhmann’s adoption of the autopoiesis concept has proved to be sterile after decades of debate. I consider that it is legitimate to raise two basic questions:

Q1 Is the intent of adopting “autopoiesis” genuinely justified for understanding the social in the first place? and

Q2 Was the procedure for adopting the “autopoiesis” concept properly conducted in theoretical terms?

I shall discuss these questions below in the next section.

5 Their second shortcoming is that their account of the debate’s history does not integrate recent developments that need to be highlighted to improve interdisciplinary research. Hence, I shall mention that at least two proposals for generalizing the conceptual framework used by M&V to build their theory of autopoiesis were not addressed by Cadenas & Arnold, as I discuss in section “The underlying general systems theory implicit in Maturana’s work.”

6 Like many other authors, Cadenas & Arnold qualify as a “self-imposed restriction” (§3) M&V’s objection to considering it appropriate to apply the term “autopoiesis” to social systems. This inadequacy stems, however, from a logical entailment of M&V’s rigorous definition of the term “autopoietic machine” when applied to entities (“systems”) that do not comply with all the rules that allow observers to qualify a dynamic system as autopoietic. This is not a self-imposed restriction, but a matter of theoretical consistency. Autopoietic systems are a particular kind of dynamic (autonomous) systems. Qualifying a system as autopoietic is the outcome of the application of the six VM&U Rules’ verification procedure. It is this verification procedure that “restricts” the applicability of the “autopoietic” qualification to only some particular dynamic entities that comply with all the rules. Removing these restrictions would imply changing the VM&U Rules, which would be tantamount to “defining” a quite different type of dynamic system that would require a different name than “autopoietic.”

“Improper adoption” of a complex concept

7 For Q1 I argue that in order to explain and account for the self-constituting, permanently self-organizing, and self-referential features exhibited by social phenomena, the “autopoiesis” hypothesis overshoots this objective. This is because features such as self-constitution (spontaneous emergence of long-lived plastic dynamic structures), permanent self-organization (recursive-iterative incidence of “internal” homeostatic mechanisms compensating against “external” perturbations), and self-reference (recursive-reflexive incidence of a dynamic unity’s “external” behaviour impinging on itself) are also ascribable to more general dynamic systems that are not autopoietic in the sense of Humberto Maturana and Francisco Varela (M&V).

8 For Q2 I argue that the implemented adoption procedure is – at least in the case of Luhmann – methodologically questionable. This is because it is “improper” (or inadequate and incomplete) any theoretician’s manner of borrowing a single complex concept developed within a theory – based on a whole associated conceptual framework – into another theory based on a different conceptual framework, without paying attention to the specific constellation of basic concepts of the original theory that make the adopted concept intelligible and applicable in its original domain of validity.

9 I think that it is rather the methodologically improper adoption of the concept of “autopoiesis” by other disciplines (including Luhmann’s sociology) that is responsible for the situation of sterile debate in interdisciplinary research regretted by the authors, not the concept itself.

10 Metaphorically speaking, one cannot blame a transplanted organ for its malfunction in a patient’s body, since the
success of a transplant operation results not only from the quality of the transplanted organ itself but also from the globalism of all external conditions that allow this organ to function exactly as it did in the donor’s body. If the adopting theory does not provide an equivalent operational version of the original constellation of operational distinctions and basic concepts intimately related to the complex concept being adopted, the latter risks becoming unintelligible within an inadequate hosting conceptual environment.

« 11 » More fundamentally, my personal regret is that— for so long—interdisciplinary research did not focus primarily on developing a common basic understanding of the whole conceptual framework underlying the theory of autopoiesis, namely, a general systems theory compatible with M&V’s onto-epistemological paradigm.

« 12 » If interdisciplinary research rigorously developed a truly domain-free understanding of the whole constellation of operational distinctions and conceptual tools that make autopoiesis intelligible and applicable in biology, other disciplines could more easily adapt and develop their specific domain-dependent applications from such a generalized conceptualization.

« 13 » I think that the adoption of a consistent general conceptual framework should be performed prior to attempting some specific conceptual transplants, and that only then could complex concepts such as autopoiesis be "adopted" by other disciplines, if necessary.

« 14 » For example, building a shared understanding of the fundamental concept of system is needed in the first place: in most arguments concerning the debate about social autopoiesis, the term "system" is used broadly as it denotes a simple evidence of the notion, whereas the definition of the autopoietic system concept relies on a very precise and rigorous definition of the system concept itself (more specifically, the dynamic system concept). The complexity of those specific abstract constructs cannot be circumvented by ignoring the foundational concepts on which those concepts are built.

« 15 » I also think that one cannot properly understand what makes an observed dynamic entity be distinguished as an autopoietic system without espousing the entire constellation of observer-related operations of distinction and derived concept construction methods used by M&V within their onto-epistemological paradigm of objectivity between parentheses. In this paradigm, the situated stance of human observers is central and all conceptual developments are considered as abstractions existing only in the language domain where human observers exist as social beings, without confusing those abstractions—i.e., objects of knowledge—with objects existing in a supposed transcendental external "reality."

« 16 » When proposing the autopoiesis concept, Maturana appealed to distinctions and abstractions related to a partially implicit general theory of dynamic systems that he contributed to refining and making explicit in several pertinent aspects related to biology. Moreover, M&V (along with Ricardo Uribe) proposed a remarkably condensed set of verification rules (the six VM&U Rules set) that, by explicitly applying more basic concepts and related operational distinctions and observations, allow the observer community to agree intersubjectively on any claim concerning a specific distinguished dynamic system as being autopoietic or not.

« 17 » M&V created, developed, adapted, and used the conceptual tools they needed as biologists, as it is customary in science for building scientific theories. The apparent general formulation of these conceptual tools revealed themselves to be appealing to many disciplines concerned with other phenomenal domains, where their applicability was sought, especially the inspiring novelty of the autopoiesis notion.

« 18 » It seems to me that instead of rigorously applying the general concepts (used by M&V in biology) to their disciplines and exploring their specific entailments in the corresponding domains, many researchers imported the name "autopoiesis" as an umbrella term. I mean by this that the term “autopoiesis” was superficially adopted as a notion, without paying due consideration to the refined specificity of the concept itself.

« 19 » In the molecular domain, M&V’s constellation of basic concepts has also been successfully used to distinguish, describe, and characterize the dynamics of other non-autopoietic molecular systems, a fact that reveals that “autopoiesis” is not the only phenomenon that the M&V’s conceptual paradigm is capable of unveiling and explaining in biology. Why should other disciplines be less rigorous in their own domains?

« 20 » If there is a serious goal for achieving a real interdisciplinarity for studying systemic phenomena, the first step should be to develop a common language, to make sure that when talking about distinctions, units, systems, structures, mechanisms, processes, self-organization, self-reference, etc., we are talking about the same kind of distinctions stemming from intersubjectively shared observers’ experiences. I think that the absence of such a common, complete, rigorous, and accepted general conceptual framework—all along with its epistemology—is at the root of this unfruitful debate, not the term “autopoiesis” itself, which is just an aspect of the whole paradigm.

The underlying general systems theory implicit in Maturana’s work

« 21 » M&V proposed a wide range of interrelated distinctions and concepts that allow us to refine the "broad conceptual openness" (§1) of existing systems theories and distinguish a variety of kinds of "systems" that are useful and explanatory when dealing with living beings and biological phenomena.

« 22 » This is not so clear in the case of sociological research when distinguishing "social entities" as "systems" of some kind. Most efforts in this direction rely mainly on borrowing some aspects of the conceptual framework developed by M&V (including the concept of "autopoietic system"), and keeping the basic "system" concept vague and undifferentiated with respect to the constellation of related concepts that participate in its rigorous definition. There is no surprise if—in this state of affairs—"the theories that deal with biological systems and those dedicated to the study of social systems have been intertwined" (§1).
Like any other scientist, Luhmann was obviously free to define the abstractions and concepts with which he wanted to develop explanations for phenomena observed in the domain of his research (his theory of social systems composed of communication entities). If “communications” and their conveyed “meanings” were for him the necessary and sufficient basic concepts, without the need to refer to the physical entities involved in the generation of “communications” and “meanings,” nor to their “actions,” he could have built his own more complex derived concepts and independently explored ways of explaining features such as the spontaneous emergence and self-reference of such systems. In my opinion, this is a perfectly legitimate choice, provided these sole concepts sufficed to propose explanations based on distinguishable mechanisms capable of generating all phenomena observed in the social domain.

So why did Luhmann need to “import” such an extraneous concept as “autopoiesis” into his theory? In my opinion, he could not import the concept but only the label, in order to (metaphorically) refer to, but not explain, the observed self-referential features that we can loosely ascribe to social systems. Explaining those emergent phenomena in mechanistic terms (as required from M&V’s conceptual framework where autopoiesis is defined) would inevitably require delving into both the psychic domain of humans and their domain of behaviours as communicating agents and “producers” of communication events – including their conveyed meanings – something that Luhmann’s conceptual framework formally forbids (“Only communication produces communication,” §11).

Cadenas & Arnold note that “[it] is almost impossible to detach the concept of system from its social and biological roots” (§2). This is a historical outcome (from Herbert Spencer to Ludwig von Bertalanffy), but they do not mention the fact that since Bertalanffy, some efforts have been made to generalize M&V’s conceptual framework underlying their theory of autopoiesis in order to justify its application to other biological or non-biological phenomena. The above-mentioned conceptual framework cannot be conceived other than as a new expanded and consistent general systems theory, (embracing the theory of autopoiesis, autonomous systems theory and other, more general, dynamic systems theories), which needs to be developed in more detail.

Although a wealth of generalization is already implicit in M&V’s work, some general concepts have been made more explicit: for example, in my “Autopoietic Systems: A Generalized Explanatory Approach,” Parts 1–3 (Urrestarazu 2011a, 2011b, 2012), and in “Social Autopoiesis?” (Urrestarazu 2014). Another more systematic contribution is provided by Mateus Esteves-Vasconcello (2013). Alas, Cadenas & Arnold seem to classify my contribution superficially as a mere extension of M&V’s work by a follower – “Urrestarazu’s social systems concept seems to go no further than that of Maturana and Varela” ($§5$) – and they probably ignore Esteves-Vasconcello’s contribution altogether.

Regrettably, Cadenas & Arnold did not mention that in my response to various OPCs (Urrestarazu 2014: 188), I explained that my “definition” of social systems was meant only as a theoretical exercise where my principal...

aim was not to ‘define’ what kind of systems social systems could be, (but) to investigate if they could be tentatively construed as circumscribable composite entities existing in an appropriate space where they could be subject to scrutiny in terms of the requirements needed to ascertain their possible autopoietic nature, as inferred from the six VM&U] rules. Metaphorically speaking, I tried to drag and drop a generalized notion of ‘social system’ into a straitjacket consisting of all the requirements imposed by the most general possible definition of autopoietic system and see if it fitted in it and at what price. ($§$ (Urrestarazu 2014: §5)

I want to clarify that because I am not a sociologist, I do not intend proposing a way of construing a concept for social systems in particular. What I did, as a corollary of my proposed methodology for generalizing some key concepts within M&V’s conceptual framework (see Urrestarazu 2011a, 2011b, and 2012), was to show explicitly that – conceived as inter-agent communication networks – social systems could not be construed as purely mechanistic systems (Urrestarazu 2014: §90).

I primarily focused on elucidating a generalized explanatory approach for construing a dynamic system concept without explicit reference to the underlying mechanisms that interrelate for us their dynamic components. In my approach, relations between components are distinguished as cause-effect couplings between elementary unities capable of undergoing changes of state [transitions] and triggering state transitions on other dynamic entities. Thus, systems’ structures are distinguished as causation flows due to interactions affecting the states of generalized dynamic abstract objects giving rise to closed causally related components’ structures evolving in time (see Urrestarazu 2011a).

On Esteves-Vasconcellos’ side, he chose to generalize the entire set of basic and derived concepts used by M&V in their works by rigorously identifying and defining fourteen fundamental concepts – relation, unity (or entity, or totality), distinction, observer, simple unity, property, environment, composite unity (or system), component, organization, structure, medium, orthogonal interaction, and class identity – and logically deriving thereof other concepts such as dynamic systems, circular systems, recursive systems, plastic systems, first order plastic systems, structural coupling, adaptation and cognition, second order plastic systems, and autonomous systems, among other domain-free theoretical constructs. Consistent with his proposed general systems theory, he advances towards the description of hu-
man social systems, not only by criticizing Maturana’s and other authors’ visions, but by also proposing the distinction of two human social systems classes: institutions and second-order interconstitutions systems, the latter category proposed as a theoretical explanation for “constructivist” systemic social work (systemic mediation, systemic family therapy, and work with social networks). He applied these concepts to describe practical cases of social systemic work in Esteves-Vasconcellos (2014).

“31” Esteves-Vasconcellos and I, although independently and through different methodologies, aimed at providing a general conceptual framework that could be applicable to any kind of dynamic entities distinguished or intuited as existing in a given observational domain, regardless of their nature. There is still work to be done in order to ascertain that there are no contradictions between both generalization proposals and whether they are equivalent or just complementary in some aspects.

“32” Whether these two highly coinciding generalization efforts could prove to be useful for tackling the specific domain of social phenomena is still an open theoretical research subject. Whatever the case, any effort to talk properly about “autopoiesis” beyond or aside the biological realm needs to refer to some accepted generalization effort to talk properly about “autopoiesis” as well beyond the biological realm. I even proposed that “[…] a possible way to circumvent [the] incompatibility between Luhmann’s and Maturana’s constructs” would be to conceive communications as process-like dynamic objects (Urrestarazu 2014: §110), provided that, for any specific social system distinguished in this way, any claim about its autopoietic nature “would need to be assessed by applying the six VM&U Rules validation test.” (ibid: §111)

Conclusion

“35” With regard to their first shortcoming, the validity of the adoption of the autopoiesis concept by Luhmann is not fully addressed in Cadenas & Arnold’s paper. I showed that this adoption is not justified (Q1) if its sole purpose is to account for the emergent and self-referential features exhibited by social systems—conceived as systems composed of communications within a meaning domain—since these features may be more generally explained for systems that are not autopoietic. I also showed that, in general, an adoption procedure is not theoretically adequate (Q2) if it is not based on the explicit adoption of the whole underlying onto-epistemological paradigm and conceptual framework that could make the concept of autopoiesis intelligible in other meta-biological or non-biological domains.

“36” With regard to their second shortcoming, Cadenas & Arnold missed mentioning recent developments in interdisciplinary research towards making explicit the general systems theory underlying M&V’s conceptual framework. At least two contributions were omitted (Esteves-Vasconcellos’s and mine), which novel ways of addressing the explicit generalization of M&V’s concepts are proposed that constitute steps towards developing a common language for disciplines seeking to explain rigorously the systemic phenomena observed in their specific fields of inquiry.

“37” I conclude by agreeing with Cadenas & Arnold when they “[…] argue that the theory of autopoiesis can only expand its horizons beyond the biological model if a theory of social systems based on communication is adopted.” (§21, my emphasis). Then, the point comes to elucidate how to develop a communication concept that is compatible with M&V’s onto-epistemological paradigm and conceptual framework. This task has not been yet accomplished satisfactorily, and I also agree with their remark that “[t]his situation must be addressed in all its complexity” (§21, my emphasis).

Hugo Urrestarazu is a former physicist educated at the University of Chile in Santiago (1969–1974)—where he was Maturana’s student—and at Imperial College of Science and Technology in London (1977–1981). In France he pursued an industrial software engineering career specialized in real time embedded systems design. Since 1990, he has been involved in independent linguistic and enterprise architecture consulting and in interdisciplinary scientific extension of the theory of autopoiesis.

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Does Social Systems Theory Need a General Theory of Autopoiesis?

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> Upshot • The authors claim that it is justified to extend the concept of autopoiesis from its biological origin to other disciplines, predominately those that have a social character. However, the authors do not lay strong enough conceptual grounds to justify this extension of autopoiesis because it is unclear what concept of autopoiesis it is that would achieve this objective, or why the concept of autopoiesis itself should be crucial to this endeavor.

“1” A fundamental question that Hugo Cardenas and Marcelo Arnold fail to address in their target article is why it is that, in their desire to unify systems theory, they require an autopoietic conception of social systems. From the conceptual point of view,
why not leave autopoietic systems theory within the confines of a theory of biological or living systems? The authors state, “we attempt to refocus the debate on the concept of autopoiesis for social systems research” (§5). The authors claim that they will analyze the “benefits shown by this concept [autopoiesis]” as it applies to social systems research and applications, “but also the consequences for social systems theory derived from specialization to a merely biological level” (§5).

2 While the authors give a stellar review of the scholarly research on this topic, they do not in fact show, as they wish to, the benefits of applying the concept of autopoiesis to social systems because they do not justify the essential claim that social systems are in fact autopoietic. Are they? Despite the authors’ suggestion that the debate concerning whether social systems are autopoietic (and on what grounds they are) has become stale, there is nonetheless no argument put forward by these authors that would decide the issue either way. Without this, the authors are left to rely on a somewhat curious strategy of listing some of the applications of autopoiesis to social systems research (in the sociology of law and art and economic sociology) as if the more the concept of autopoiesis has been applied to the separate researches and research fields, the more evidence there is that social systems are in fact autopoietic. But are these various applications to social systems really deploying properly autopoietic concepts? Have the arguments of Humberto Maturana and Francisco Varela – i.e., their protest concerning the extension of autopoiesis to social systems – been defeated conceptually, or might the authors’ examples of applications be based on a false (or simply metaphorical) understanding of what constitutes autopoietic systems proper?

3 It is far from obvious that the applications in the sociology of law, economic sociology, sociology of art, etc., are in fact conceptually grounded in a theory of autopoietic systems. Not a few of these applications listed in the target article, it should be mentioned, end up borrowing Niklas Luhmann’s notion of autopoiesis rather than Maturana and Varela’s. This point needs to be addressed more directly since it is possible that these applications qualify only as Luhmannian (that is, social) cases of autopoiesis (which may not be autopoiesis after all, if Maturana and Varela are correct). These applications are theories of, mainly, social systems researchers and are thus already well within the Luhmannian understanding of autopoietic systems theory, thus a-priori foreclosing the possibility that such frameworks might not be autopoietic.

4 In relation to the above, it is unclear just why it is that the authors seem to require a theory that confirms that social systems are autopoietic in the first place. The authors claim that autopoiesis is one of the fundamental concepts of the constructivist epistemology, but I fail to see how this insight necessarily assists the authors in their desire to unify systems theoretical research. Could this act not be performed by dropping the autopoietic concept from the realm of social systems? Must the unified framework of systems theory, the authors’ desire to promote the development of new interdisciplinary research in systems theory, be so Luhmannian-Maturana-Varelian; must it be autopoietic? Why? Is the logic merely that more researchers have found productive research paths when accepting that social systems are autopoietic and that those who keep to the notion that social systems are not autopoietic have found less productive research paths? Yet even if this is the case it does not support the assertion that the former researchers are actually doing research on properly autopoietic systems. Only an argument that defeats Maturana and Varela, on conceptual grounds, by showing that social systems are in fact autopoietic could support this position.

5 To their credit, Cadenas and Arnold do attempt to point out the main weaknesses of Maturana and Varela’s position on the non-extension of the autopoietic to the social, but none of the “weaknesses” they point out actually concern conceptual aspects of this position. Instead the authors tell us their ideas are based on “old and outdated paradigms” (§26). But, at the level of argumentation, just what is it that, owing to this outdatedness, makes Maturana and Varela wrong? Nothing on this is said. Instead readers are merely told, “[t]his partly explains the fact that most sociological research on social systems has not followed this path” (§26).

And of course if one’s goal were to unify systems theory, and one wished to do so by incorporating social systems and the theory of autopoiesis (as our authors wish to do), then this would appear to be a significant point. But this sort of argumentation says nothing about the accuracy or inaccuracy of Maturana and Varela’s conceptual claim(s).

6 Cadenas and Arnold also note, quite oddly, that Maturana in particular offers “the inexplicable and express renunciation of sociological knowledge” (§26). First, is it sociological knowledge he renounces or does he renounce the notion that sociological knowledge is of the same methodological or paradigm-type as autopoietic systems theoretical knowledge? More curiously, though, what is inexplicable about this renunciation? This is left unstated and seems unfair to Maturana’s explanatory framework of “everyday life,” or his other concepts of the social. On this point, Cadenas and Arnold then argue that “in terms of [Maturana’s] contribution to understanding the social phenomenon, there is no qualitative improvement of current sociological knowledge. In a way, it is a more a regression” (§26). Maturana and Varela’s “advanced” conception of biological systems “has a minimum impact on their notion of social systems” (§26). Even granting such a regression or minimal impact, this changes nothing in whether social systems are autopoietic.

7 Similarly, the authors claim that Maturana and Varela’s account of social systems is “a middle-range theory” (§27); “focuses on social groups” (§28) rather than complex social systems (are social groups not complex social systems?); “definitively rejects giving a universalistic relevancy to social systems” (§29) (but whose goal is this anyway?); is utilitarian ($31); and is similar to the theory of biocenosis (§32). Still, absolutely none of these points demonstrates that Maturana and Varela are wrong about the way in which they wish to limit the concept of autopoiesis. So it is arguable that Cadenas and Arnold have failed to show how these traits are problematic from the conceptual point of view – for instance, how might Maturana and Varela’s advanced conception of biological systems actually augment the concepts the authors would wish to see put in place within their (perhaps curious desire for an) autopoietic social systems theory – and not simply from the
point of view that presumably preferable, non-“outdated” social systems theories do not have these traits. The authors do state that these traits “are a direct consequence of subsuming the explanation of the social phenomenon to the biological” (§34) and this might go some way toward a conceptual clarification of the flaws of Maturana and Varela, but more could have been said on this. Yes, it can be argued that Maturana and Varela do maintain a “vague sociological and anthropological view of social systems,” (§34) but this does not indicate how their conception of autopoietic systems theory (indeed of any conception of autopoietic systems theory), appropriately integrated within social systems theory, might help to do the job, if it can, of productively using autopoietic systems theory within a more unified systems theory (as the authors wish to use it). This last point reflects the nub of my earlier criticisms as well.

Again, Cadenas and Arnold do none of the heavy-explanatory lifting where these conceptual issues are concerned. This is particularly visible in the “Results” section of their abstract, in which they declare:

“8” Again, Cadenas and Arnold do none of the heavy-explanatory lifting where these conceptual issues are concerned. This is particularly visible in the “Results” section of their abstract, in which they declare:

“It is one thing to say analytically that communications generate communications, but operationally they require people to undertake specific actions and make specific choices... One communication may stimulate another, but surely it does not produce or generate it.” (Mingers 1995: 149)

But there is insufficient argumentation for this supposed “justification.” What is sorely lacking are arguments that state just what the correct concept of autopoiesis is that would justify such a unification or would justify why the concept of autopoiesis itself should be so crucial to this endeavor, especially considering that, as the authors’ claim:

“[w]e claim that it is justified to extend the concept of autopoiesis from its biological origin to other disciplines, and to develop its interdisciplinary character, following the spirit of systems theory and constructivism.”

If we try to apply the theoretical principles of Maturana and Varela to a more complex social systems theory, huge explanatory problems arise. The amount and density of social phenomena that fail to be explained by this theory are so extensive that it becomes necessary to limit these ideas to a very specific set of phenomena. (§38)

Notwithstanding the irony that this is partially why Maturana and Varela were leery of extending autopoietic systems theory to social systems theory (including Luhman-nian) in the first place, it can be argued that this explains Maturana and Varela’s hesitation in this regard and their reasons for moving on to theories of social groups and, in Maturana’s case, “everyday life” (this is hardly the issue where the target article is concerned). So while it appears possible that such a statement ought to mean that Maturana and Varela should have extended their concept of autopoiesis more progressively toward an autopoietic theory of social systems, it does not necessitate that it means this. Maturana and Varela might just have been correct that social systems are not autopoietic because social systems are not bounded in the same ways. John Mingers expresses similar doubts regarding the extension of autopoiesis to the social:

“9” It seems very plausible that the dynamics Maturana and Varela assigned to social systems just do not carry over to social systems in the ways that Luhmann or any other social systems theorist may have wished them to. Again, why do the authors require an autopoietic theory of social systems to unify systems theory?

“9” Certainly the target article’s extensive, excellent review of the scholarly literature on the debate on the concept of autopoiesis and its limits should help with the development of new perspectives on the debate. Still, lacking the conceptual argumentation for why an autopoietic system ought to be adopted toward the cause of a unification of the field, lacking a clear statement regarding which (whose) autopoietic system ought to be adopted, and lacking conceptual clarification about what the nature of a social systems theoretical autopoiesis might look like (perhaps some less regressive concept of social autopoiesis than is given in Maturana and Varela’s discourses on society), this target article cannot yet state that important changes to practice should be made – in contrast to what the authors claim in the “Implications” section of their abstract. The development of new methods or concepts capable of unifying systems theory or constructivist epistemology requires fleshing out the notion of the “formal principle” (§51) the authors propose and a stronger conceptual clarification capable of filling in the lack or gaps that remain in lieu of the authors’ own conceptual clarifications.
mediately evade the issue by saying that “analysis of these criticisms exceeds our ambitions.” This will not do. The authors should either (i) argue that “social autopoiesis” can engage the political dimension (although they will have a hard time of it, because to date the record of social autopoiesis is not good); or else (ii) come clean, and say that in their view politics is not important, and that science should not get mixed up in politics. In this case, our disagreement would be clear and complete.

2 The authors devote a whole section (§§23–39) to criticism of Humberto Maturana and Francisco Varela’s own attempts to develop a theory of social systems, in which they explicitly decline to use the concept of autopoiesis. Maturana and Varela’s social theory is undeniably poor; but it does not follow *at all* that if they had used the concept of autopoiesis in their endeavours they would have fared any better. Thus, this whole section is unfortunately somewhat beside the point. Likewise is the question as to whether social systems can and cannot properly be considered as “autopoietic.”

3 Finally, there is the question of biology. Contemporary biology is focused on molecular biology, and it is openly gene-centred (witness the lamentable current fashion for DNA-sequencing, a mindless endeavour if ever there was one). This has induced the noted biologist François Jacob to declare openly: “Life does not exist” (see Stewart 2004). In this, he is (unfortunately) quite correct: at present, “life” does indeed not exist as an epistemologically well-constructed object of biological science. Personally, both as a biologist and as a citizen, I consider this a scandal. There is a genuine challenge here: both to construct an epistemologically well-founded concept of “life,” and to gain acceptance for this concept in the relevant scientific community. It is in this context that the concept of “autopoiesis” does have a key role to play. And this issue – the sort of biology that our society will construct and put in place – is actually, in its way, a highly political issue. It is in this sense that the concept of autopoiesis is, already, a highly-charged political issue. Vague speculation about “social autopoiesis” is, unfortunately, an untimely distraction from what is at stake.

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Autopoiesis Applies to Social Systems Only

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> Upshot • I reaffirm and extend the notion of social autopoiesis away from mere labels and descriptions to acting physical components of social systems and societies, ranging from subcellular to biological and human. All self-producing biological organisms are essentially societies of interacting components and therefore notions of autopoiesis and social systems are fundamentally, if not definitionally, interrelated. Some examples of real-life applications of social autopoiesis are also given. Future generations of scientists might even find the qualifier “social” redundant because there is no other autopoiesis than “social.”

So we are continually making and marring our own lives and the lives of other people by a word, an action, a thought.

1 It is an unexpected pleasure to encounter two Chilean authors from the University of Chile addressing the issues of social autopoiesis – decades after their famous predecessors, Francisco Varela and Humberto Maturana. I still consider Francisco and Humberto as my teachers since the time of their first working paper, delivered into my hands when I was starting at Columbia University in the early seventies. They probably would not call me their follower since I have ignored their aversion toward social systems.

2 There can be no autopoiesis without actively interacting components. In order to interact, such components must communicate. Communication is not just the passive exchange of information, but mutual stimulation and induction to real action, in time and space. Components must act, i.e., respond in direct or chained reciprocity and mutual cohesiveness of their action. Such engendered action connects the components into networks. Such networks become stronger, predictable and autonomous under the influence of repetition. Such repeated action brings forth the rules of behavioral patterns and is itself affected by the same rules it has generated. The continuous making, degrading and remaking of such patterns is the very foundation of life – cellular, individual or social. Perpetuating the network of such interactions can be referred to as a social system. Its components are not separate or randomly interacting entities – they form a society. This was addressed at an early multi-author symposium involving Maturana (Zeleny 1980).

3 Such societies can persist autonomously – either for fleeting moments or for millennia, depending on the reliability (rules) and repeatability (components renewal) of their interactions. These societies can be small or huge, autonomous or semi-autonomous, sharply or fuzzily delineated or separable from their environment. Among the examples, we can list societies of cells (and intracellular interactions), multicellular organs and organisms, societies of insects (ants, bees, termites, etc.), societies of...
autopoietic and whatever is autopoietic ever in nature is so organized could become autopoietic and whatever is autopoietic could become alive. In other words: all living systems must be autopoietic, but not all autopoietic systems have to be alive.

Autopoiesis as emergent

8 | Simplistic equalizing of autopoiesis with life is misleading. Autopoiesis cannot be an all-or-nothing proposition. It emerges from non-autopoietic precursors; it weakens, is arrested or fades out. There are at least fifty shades of amassed autopoietic precursors, post-autopoietic (or allopoietic) fade-outs and systems too fast, too slow or too vast for humans (being components themselves) to be perceived (or established) as autopoietic. There are also partial or constrained autopoiesis (heteropoietic interventions1), autopoietic processes in inorganic milieus (synthetic biology in the sense of Stéphane Leduc 1912), etc. Autopoietic systems emerge, and their process of becoming, not just being, is yet to be addressed. Pre-autopoietic systems have to attain self-sustainability (not just sustainability) of their autopoietic processes in order to be recognized as "living."

9 | In addition to self-sustainability, there has to be a requisite equilibrium (or balancing) among all constitutive processes of autopoiesis. The circularity of concatenated processes is not sufficient for autopoiesis. Autopoiesis is fundamentally about equilibrium. Even the smallest deviations in constitutive processes have to be compensated and the equilibrium restored. Otherwise, the system lapses into one of the fade-outs, such as dissolution or death, allopoietic arrest or heteropoietic maintenance of sustainability. How such equilibrium is attained, maintained and repaired/restored has not yet been sufficiently addressed. Unfortunately, the simulation models in Zeleny & Pierre (1976) and Zeleny (1977) have been neglected and thus useful insights weakened.

Circularity of social systems

9 | Figure 1 shows the minimal cycle of processes necessary for autopoiesis: Production → Bonding → Degradation → Production. This scheme is the fundamental key to autopoiesis. The circularity is crucial in many ways. It indicates the necessity for autopoietic communities, organizations, and societies, which is why autopoiesis is applied only to social systems, not to physical or biological systems. The three necessary processes of autopoiesis are production, bonding, and degeneration. These processes are interrelated and interact with each other, forming a closed loop that is essential for the sustainability of autopoietic social systems.
domains, regardless of the labels. Complex and sophisticated simulations (including cell division, multicellularity, heteropoietic interventions, etc.) can be constructed based on this simple scheme. Notice that no a priori introduction of "membrane" is needed, because it is a natural (by)product of autopoiesis, in multitudes of forms, across all domains. Exclusion (or weakening) of any one of the three constitutive processes (i.e., production, bonding and degradation) can lead to fadeout (dissipation), two-state pulsation or allopoiesis.

The houseleek or Sempervivum (also known as livetree or hens and chickens) is a good example of an autopoietic cycle. Individual rosettes multiply vegetatively and form a tightly packed community on a rock, roof or patch of soil. After older rosettes flower, they die and provide a new space for the new plantlets to enter. The community is thus being continually renewed, maintaining its self-production for decades, as long as all three constitutive processes of autopoiesis remain viable. Autopoiesis of a social system lasts longer than that of its components. Similar social networks would be large and tightly packed communities of penguins or sparse and vastly loose communities of wolverines – all surviving for hundreds or thousands of years, in spite of the ceaseless turnover of individual members (Zeleny 1996, 1997). Some readers may find it unusual to call plants social (yet, they form communities, communicate across large distances and are parts of complex physical networks, with animals, insects and humans). Therefore, please allow me to discuss this is in the remainder of my commentary.

Precursors of autopoiesis

It is then not surprising that the first ideas of self-production emerged in social systems rather than in biology. Examples abound, e.g., Giambattista Vico’s corso e ricorso, Adam Smith’s invisible hand, Joseph Schumpeter’s creative destruction. Social systems of autopoietic components must themselves be autopoietic – they are necessary for autopoiesis in the sense of holism because autopoiesis itself is the necessary condition for adaptation, development and evolution.

When the scholastic debate about social autopoiesis reached its intellectual nadir, I had opted out from the discussion of its descriptions of action (information) in favor of coordination of action itself (i.e., knowledge and wisdom); I devoted myself to corporate consulting, mentoring and coaching, using social autopoiesis as the underlying guide to action. Examples of some very successful constructs are outlined in Figures 2 and 3.

Figure 2 shows the underlying model of circular organization of a business corporation. While the organization is persistent, circular and autopoietic, the structure is a temporary allopoietic “snapshot” of underlying autopoiesis. In Figure 3 an internal market of the Kyocera “amoeba system” of continuous building and rebuilding of an intracompany market is depicted.

Why autopoiesis only applies to social systems

Maturana and Varela drove an unsustainably mechanical wedge between social systems and their components by contradicting holism. They excluded a most remarkable autopoiesis of natural social systems, such as termites, bees, ants, amoebas, and ignored the obvious social nature of both multicellular and unicellular organisms, as well as organs such as brains, neural systems, etc. Organisms and their components are themselves social systems ad infinitum. By “social systems,” they referred to human political systems, but had not recognized ubiquitous spontaneous social orders. They confounded social autopoiesis with dictatorship (“system of tyranny”); or even worse, with Luhmann’s humans-free (non-physical) virtual networks of symbolic communications (Zeleny 1995).

By the end of the 1990s, Varela had developed divergent thoughts. He recognized the age-old observation of John Amos Comenius, Adam Smith and Friedrich von Hayek – he called it “relatively recent (and stunning)” (Varela 1999: 52) – that even simple social systems “give rise to … a purposeful and integrated whole, without the need for central supervision” (ibid) – even citing “the most compelling of these examples is the social insect colony.” Varela appeared to be puzzled and genuinely surprised by his “discovery” of social autopoiesis: “…its separate components are individuals and it has no center or localized self.” (ibid: 53). To his astonishment, “[t]he import of this model of how complex systems exhibit emergent properties through the coordinated activity of simple elements is, in my eyes, quite profound…” (ibid).

In 1975, Stafford Beer wrote the preface to Autopoietic Systems (Maturana & Varela 1975), where he presents a number of insights into social systems, which are relevant to our argument.

• The necessity of physical components: “The notion of coding is a cognitive notion which represents the interactions of the observer, not a phenomenon operative in the physical domain” (ibid: 10).

• Before human observers emerge: “Nature is not about codes: we observers invent the codes in order to codify what nature is about” (ibid: 11). This could be
applied to the target paper on Luhmann's conception of "social system."

- Without doubts: “Yes, human societies are biological systems” (ibid: 12).
- On Maturana: “…presumably at least one of the originators of autopoietic theory disagrees…” (ibid: 12).
- Finally, “…any cohesive social institution is an autopoietic system…” (ibid: 13).²

The rest of Beer's argument I paraphrase because, undoubtedly, the reader got the message about his stand on social autopoiesis. What is puzzling is why do Maturana & Varela not follow this line of development themselves? Why do they not write about the nature and adaptation of social institutions and the evolution of society itself? In this commentary I have tried to provide some answers. The fact is that if a social institution is autopoietic, then according to the authors' own argument (autopoiesis is necessary and sufficient to characterize the organization of living systems, it is necessarily alive.

² “17” Beer concludes: “It seems to me that the authors are holding at arms length their own tremendously important discovery” (ibid: 15). One simple logical step and they could claim a "tremendously important discovery." They did not. It also explains why the current author has since 1975 devoted all his efforts to the development of social autopoiesis.

² “18” Another poorly defended claim was their belief that all living systems are autopoietic and all autopoietic systems are living, without actually proving the latter. Simulation models of autopoiesis show that autopoiesis is a systems property acquired only gradually – it is incorrect to claim that autopoiesis either is or is not; there are different developmental stages, only differentially compatible with life. This was well understood by their computer expert Ricardo Uribe, later "removed" from the original troika. The autopoiesis stage can be too fleeting to be observed, especially when taking place with inorganic components. The origins of life emerge from the non-living, through autopoiesis, gradually, not suddenly.

² “19” Their insistence on a visible and physical membrane as a constitutive attribute of the autopoietic process ignores the fact that the membrane is only one of the produced components. Membranes are often invisible (detectable only through behavior), or too sparse and distributed to be detected. Again, some computer simulation is indispensable for understanding physical autopoiesis (Boden 2000; Zeleny 1977).

² “20” Many decades have been spent on scholastic discourse about the essential inapplicability of autopoiesis to social systems. But it is our economic, social and political systems that are now undergoing historical transformation and metamorphosis. As Cadenas and Arnold's target article demonstrates, social autopoiesis must be about physical entities (e.g., humans), not just human concepts or labels. Self-production, for sure, had existed before humans emerged with their labeling, construction and re-construction.

² “21” We are currently all suffering from ineffective applications of the mechanistic machine-like paradigm in addressing the long-term effects of secular stagnation and upheavals. Instead, we could have applied autopoiesis as an excellent tool and necessary ingredient for shifting towards a more biological, organism-like paradigm of adaptive and learning social systems – towards evolutionary economics (Zeleny 2010, 2012), treating autopoietic social systems as self-produced organisms rather than man-made mechanisms.

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Explaining Social Systems without Humans

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> Upshot • I argue in favor of not eliminating humans from social theory. My argumentation is based on the "mechanistic" perspective that emerged in the interdisciplinary context of systems theory but that is lacking in Luhmann's work. Based on defining communication in the constructivist-mechanist tradition, I claim that research on human (near-) universals contributes to solving the constructivist problem of how understanding among individuals is possible. I also argue against the author's critique of an "utilitarian" approach and for maintaining the individual and social level in systems theory. Finally, I address the observer-problem in Luhmann's theory.

>1 » In the early 1970s, following Heinz von Foerster's recommendation, I became familiar with the writings of Humberto Maturana. Together with Gerhard Roth and Wolfram K. Köck, we discussed Maturana's papers and finally translated his "Biologie des Erkennens" (1970) into German. In the meantime, I had started working on my doctoral thesis following an invitation by Niklas Luhmann. In August 1975 I sent our Maturana translation to Luhmann, who initially was quite skeptical about the aspects linked to Maturana's concept of "circularity" of the processes in living systems. But some discussions later in March 1976 he changed his mind with respect to what was to be called the theory of autopoiesis. During the following years I co-organized a number of conferences (Hejl, Köck & Roth 1978; Benseler, Hejl & Köck 1980; Roth & Schweger 1981). However, even though he had begun to embrace autopoiesis, Luhmann did not attend any of them. Despite numerous discussions, Luhmann's and my views differed with respect to the central question Hugo Cadenas and Marcelo Arnold address in their target article: Should social systems be modeled as autopoietic (Luhmann) or should social systems be constructed as resulting from a
SoCIOlogICAl ConCePTs In The TheoRy of AuToPoIeSIS

The history of systems theory relevant for the concept of autopoiesis goes back to the late 1940s and 1950s, when transdisciplinary discussions lead to cybernetics, artificial intelligence, systems theory, cognitive science, and new concepts of information and communication, etc. At that time, the Macy conferences (Dupuy 1985) played a stimulating role. Anthropologists, electrical engineers, biophysicists, physiologists, social scientists, psychologists, mathematicians, biologists, etc. had to establish a general vocabulary and general concepts to discuss communalities of otherwise incompatible phenomenal domains. Talking of “systems” was helpful in that context. In addition, many of the participants shared a “mechanistic” understanding of “scientific explanations” (Heims 1985). The basic idea was that theories should allow to analyze and even construct physical mechanisms that would produce the behavioral or cognitive properties one was interested in.

Coming from this tradition, Maturana also shares this mechanistic conception. It is clearly stated in his often repeated explanation of what he sees as the core of “the scientific method”:

“This method can be described as involving the following operations: (a) observation of a phenomenon that, henceforth, is taken as a problem to be explained; (b) proposition of an explanatory hypothesis in the form of a deterministic system that can generate a phenomenon isomorphic with the one observed; (c) proposition of a computed state or process in the system specified by the hypothesis as a predicted phenomenon to be observed; and (d) observation of the predicted phenomenon.” (Maturana 1978: 28f)

Let me start with the concept of communication and what happens in communication as example. Figure 1 shows the most important aspects of communication in a strict sense from a constructivist position.

Figure 1 • Human communication and media from a constructivist position.

to make the intended communication successful. Of course, he has some expectations about his partner. Communicator 1 might remember his experiences during earlier communications, perhaps he has known his partner for some time and generated a "theory of mind," which in fact is a kind of mechanistic model of the cognitive functioning of Communicator 2 and used to construct (select?) the most promising communicative offer (Byrne & Whiten 1988; Patel, Fleming & Kilner 2012). Alternatively, the partner might be dressed or talk in a way that suggests to Communicator 1 how the other might react etc. As a consequence, he decides how to address the other. More or less consciously and based on his experience in various social and nonsocial environments, he has to decide which verbal and/or non-verbal media he should use to be successful. Finally, his choice depends as well on the repertoire of means of communication he has inherited (e.g., Pelegr et al. 2006) and then developed ontogenetically, as well as on his learned verbal and non-verbal means of communication (choice of words, rules of behavior, etc.). Finally, he has to choose among the media available in his actual situation. 

« 9 » When Communicator 2 receives and reads or hears ("processes") the message, the just-outlined highly complex process takes place again – but in the opposite direction and with an important difference. The receiver's reading is conditioned by all the aspects that influenced the producer of the message, with the difference that – almost – all of the aspects that influenced the producer of the message are experienced differently due to the self-reference of the receiver and the unavoidable differences between individuals. In addition, the receiver's final goal is not to reconstruct the meaning Communicator 1 had in mind. He is interested in what the message means for him. What does he wants me to do? Why is she telling me that? Is this chunk of knowledge interesting to me? 

« 10 » It is not astonishing that, as Cadenas and Arnold emphasize, Maturana and Varela agree with a modeling of communication based on the interaction of (actors as) autopoietic systems that concludes that "communication is not a transmission of meaning." But this is just the state of the art at least since the early 1970s, when Maturana published his "Biology of cognition" (1970). It is more astonishing to call communication "an operation of distinction by a self-referential system" ($\S 10$). In fact, if "distinction" means "selection" out of a set of alternatives, then the agreement of Maturana & Varela is a surprise. (But perhaps the authors did not look carefully enough at what Maturana & Varela agreed with). Normally, "distinction" means that there is a choice and that one or several of the offered entities/meanings, etc., are selected. In order to make this happen, it is necessary that there is a transmission of what to choose from. And if communication is about "distinction by a self-referential system," the transmission-concept of communication comes in again through the backdoor. 

« 11 » However, as a radical constructivist I do not speak of an "operation of distinction" when talking about the activities of a receiver of a message: she constructs (produces) what she takes (too often) as "the meaning." This activity is actually best explained by the model of autopoietic and hence self-referential systems. Let me mention just one of the questions that follows from the logic of the model used: How can we explain understanding if meaning is constructed? 

« 12 » Constructivists often underline that the autonomy of individuals who construct their realities, meaning, etc. is a result of the dynamics of their own cognitive mechanisms and, being historical systems, the states they are in at a given point in time. If one takes this seriously, and that is what characterizes radical constructivism, one has to explain how "understanding" or "successful communication" is possible. What characterizes communicating actors who are successfully able to coordinate their behavior through communication (Maturana & Varela 1987: 210ff)? Breakdowns of communication do happen and it can be argued that there are probably many problems that result from it. From a mechanistic (and socio-evolutionary) perspective, the likelihood of failures of communication must have been a crucial condition throughout biological and cultural evolution for the growth of communication and the advantages that go with it. Fortunately, the mechanistic perspec-
tive also provides an answer to the problem of reducing differences between processes of construction: the more constructors (or their constructing mechanisms) function in a comparable way (the importance of the constructs of environments are not discussed here), the smaller are the differences between their constructs. Independent of its degree of autonomy, if a self-referential system functions like me – or if I know how it functions – I am able to choose or to produce the message that has the effect that I desire. (Hejl 2011). There is an increasing number of research results on biological and cultural heritage that – among other effects – produce what might be called "human (near-)universals," i.e., behaviors, preferences, emotions that are basically the same even in cultures that have had no or very little contact with each other over long periods of time (Murdock 1945; Brown 1991; Antweiler 2009). With respect to the question of communication or cooperation, such near-universals reduce differences between actors and facilitate successful interactions of various kinds. Moreover, such near-universal human properties are present in all societies as evolved dispositions. As many of them evolved a long time ago, in many cases they are problematic in the context of modern conditions of living and hence in need of regulation – food preferences and the male tendency to violence are just two examples. 

« 13 » With respect to the question of how to use the theory of autopoiesis in systems-theoretical modeling of phenomena central to the social sciences, broadly taken, my position looks quite traditional. If one uses a mechanistic approach, one has 

a I try to describe the phenomenon one is interested in – here: communication between actors seen as autopoietic systems. This has to be done 

b I through the proposition of a model that allows identification of different processes and their relations involved in producing the phenomenon to be explained (Figure 1 plus discussion). Then one should 

c I make predictions or identify problems or consequences resulting from the functioning of the model (How is successful communication possible between autopoietically functioning individuals?) and 

d I try to observe the predictions (gene-culture coevolution, (near-)universals). From the very few explanations presented here, it should be clear that such an approach
not only allows but necessitates interdisciplinary cooperation and an appropriate terminology as well as at least openness to empirical work.

> 14 » To conclude, it might be helpful to point at the rather strange remark in §31, where they criticize Maturana and Varela’s proposition of “a utilitarian concept of social systems.” Although I do not share their view of social systems in all details, it seems evident to me as an observer that without individuals who cooperate hoping to serve (directly or indirectly, immediately or with some postponement) their interests (and this means very basically surviving and reproducing), there would be no sociability and hence nothing like the enormous variety of social activities that we construct as social systems. Of course, we know that the old utilitarian conviction is wrong: it saw humans primarily as rational actors seeking to maximize their individual benefits. Since humans and their individual and social behaviours are to be constructed as much more complex, the theory of social systems has to integrate these highly complex biological systems.

> 15 » Keeping individuals within social theory does not at all imply a reductionist position. On the contrary, it is important to design carefully how individuals participate in social systems and to distinguish different levels of interactions and their properties. To explain the behaviour of social systems one has (a) to look at individuals who, with different parts of their capacities, act, interact, and communicate as components in various social systems. At the same time one has (b) to observe the organization of the social systems one is interested in as systemic properties that explain large parts of the behaviour of the systems that are independent of many of the particular components (Hejl 1995, and with respect to management Hejl & Stahl 2000). As I see the problematic relation between individuals and social systems, it is necessary to give up the dualism between holism (the level of systems) and reductionism (the level of individuals). This requires overstepping the borders and traditions of sociology as part of the humanities, an understanding of scientific explanations at least compatible with the mechanistic orientation of the natural sciences, and the readiness to interdisciplinary beyond a rather opaque adoption of terms and concepts.

> 16 » I would like to end with a question some readers may have been puzzled by all along: Why did Luhmann, a jurist with experience in administrative law, decide to propose a theory in which communication is the central activity? If we look at the judicial system, especially of judges and courts in the Roman-law tradition, it is clear that their main activity is communication and selecting meanings from texts. At the same time it is evident for all participants that, if there are conflicts, “communication within (the higher instances of) the system” will decide/select the meaning that is viable for the time being (Hejl 1997). The very last question then is: Why is access to these higher instances often a matter of political debate and struggle?

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Communication is Meaning-Based Autopoiesis

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> Upshot • Autopoiesis based on meaning is a rich conceptual tool. It would be a pity to reduce it to a few general statements on self-reference in social systems.

> 1 » The “Results” presented in Hugo Cadenas and Marcelo Arnold’s target article are announced from the very beginning as a claim, namely “that it is justified to extend the concept of autopoiesis from its biological origin to other disciplines.” As envisioned by the authors in their conclusion, these results will most certainly open promising perspectives for interdisciplinary research and contribute to overcoming the many hesitations inspired by Humberto Maturana’s public position against such developments. In many of his writings Niklas Luhmann explains how and why he chose to include autopoiesis in his theory of meaning-constituting systems, building on what he calls Maturana’s innovation (Luhmann 1985b: 6). He invariably concludes with declarations such as: “In principle, I do not see a decisive difference between his theory and mine” (Luhmann 2013b: 77).

> 2 » Without questioning the validity of those sections of the target article where Luhmann’s vision of autopoiesis in social systems is confronted with criticism both from the original authors of the concept and from other social theorists, one could say that there is a missed opportunity in the section entitled “From self-reference to autopoiesis of social systems” (§§6–14). It would gain in convincing power if more effort was invested in describing how social systems operate as meaning-constituting systems (Luhmann 1995: Chapter 2; 1990: Chapter 2; 1987). Meaning is briefly mentioned in §7, §10 and §14. The sentence that introduces and the one that concludes §14 both allude to the distinction between life-based autopoiesis and meaning-based autopoiesis. Little more is offered.

> 3 » The following comments are limited to that one section of the target article. They are not meant to undermine the contribution made by the authors to refocusing the debate on the concept of autopoiesis and promoting a much needed development of interdisciplinary research using this concept.

> 4 » Sadly, when introducing the notion of meaning in §7, the authors take many short cuts. For example, they propose that “the social system itself is a ‘selection’ between different possibilities that meaning offers.” Such a declaration gives little weight to the extended analysis provided in Luhmann (1982b) – which is the reference quoted – where the framework is clearly identified from the beginning as a “general theory of meaning-generating systems.” Meaning
forces the system to make a selection since a choice has to be made “among the totality of possibilities for relationship or references to other things indicated in the meaning actually given” (Luhmann 1995: 134). Furthermore, the history of a social system can be seen as a history of what selections were made. But to go further than that and insist that a system “is” a selection could lead the reader astray in the context of this target article.

> Viewed as the operation of a social system, a selection is an event. What happens is worth noting: meaning is “constituted.” In §7, Luhmann (1982c: 70) is the reference offered at the end of the third sentence, which is about self-selection and boundary-formation. Here again, Luhmann’s introduction of meaning-constituting systems is omitted. In Luhmann (1982c: 70), “self-selection” is discussed, but not in relation to boundary-formation (which appears rather on page 71). One can read instead that social systems “constitute themselves through processes of self-selection.” To complete this sentence, Luhmann then adds: “just as living creatures constitute themselves through processes of autocatalysis.” Here, meaning-based autopoiesis in social systems and life-based autopoiesis are introduced side by side.

> Luhmann – and this will prove to be a powerful conceptual insight – defines autopoiesis “as a general form of system-building using self-referential closure” that can be observed in systems including, but not limited to, living systems (Luhmann 1986: 172). In Luhmann’s theory, psychic systems – constituted on the basis of a closed self-referential nexus of conscious states – and social systems – constituted on the basis of a closed self-referential nexus of communications – are interpenetrating meaning-constituting systems (Luhmann 1995: 59; 1990: 23f). At the very end of the section of the target article under scrutiny, in §14, the reader will be told swiftly about these two levels of system formation in two sentences, one at the beginning of the paragraph, one at the end. Luhmann’s major conceptual innovation is presented in §14 as moving the problem of autopoiesis “from the plane of the physical space” to the realm of meaning. We also find in §11 a puzzling sentence indicating that “the autopoiesis of society operates the autopoiesis of individuals,” this being done “at a different level from the organic level.”

> Once it has been established that life and meaning are to be distinguished as two different kinds of autopoietic organization, attention can turn to the fact that meaning is “constituted.” Luhmann comes up, as the authors rightly point out in §7, with a definition of meaning as the unity of the difference between the actual and the possible. Such an approach to meaning is developed by Luhmann with explicit references to Edmund Husserl and, according to him, the best way to examine the constitution of meaning is the phenomenological method (Luhmann 1990: 83). He criticizes Husserl, though, for using the word “constitution” as “a central category that remains ambivalent” (Luhmann 1990: 69). He notes that Talcott Parsons uses the word without defining it. He also explains that he chose the term “constitution” to describe the “being-possible-only-together” of order (the system) and the full complexity of the world:

> Meaning remains internal to the system, though:

> When better equipped to appreciate the central place occupied in Luhmann’s theory by meaning and its constitution, the reader might grasp more quickly, when proceeding to §8 and 9 of the targeted article, why it matters so much whether a self – as element, as process or as system – is capable or not of referring to itself as a self. Luhmann considers that his contribution to the theory of self-referential systems requires nothing less than “a new paradigm” (Luhmann 1995: 10). Indeed, it could be somewhat unsettling for some to realize that in Luhmann’s theory, a self includes self-reference “within itself” (Luhmann 1995: 446).

> What is missing in §8 is a clear statement that self-reference allows a self to switch from self-reference to hetero-ref-

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Table 1 • Securing connectivity through basal self-reference.

<table>
<thead>
<tr>
<th>Basal self-reference</th>
<th>Basal self-reference in a social system</th>
<th>Basal self-reference in communication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self</strong></td>
<td>The self that refers itself is also an element</td>
<td>Communication (self) coordinates three selections in each of its elements: information (hetero-reference), utterance (self-reference) and understanding</td>
</tr>
<tr>
<td><strong>Connectivity</strong></td>
<td>Relations among elements hold out a prospect of connectivity</td>
<td>Successful relational connections recursively produce a network of communications</td>
</tr>
<tr>
<td><strong>Autopoiesis</strong></td>
<td>No autopoiesis without basal self-reference</td>
<td>No autopoiesis in social systems without communications connected to further communications</td>
</tr>
</tbody>
</table>

http://www.univie.ac.at/constructivism/journal/no/2/169.cadenas
ferences by means of internal operations in search of connectivity. Luhmann explains that self-reference “includes the capacity to determine itself internally through a combination of ‘self-identity’ and ‘self-diversity’ and at the same time to leave room for external co-determination” (Luhmann 1995: 290). Meaningful internal references as well as external ones are constituted inside the system, since meaning does not exist in the environment. The system cannot operate in the environment, as pointed out a bit late in §9, and the distinction between self-reference and hetero-reference (or other-reference) has to remain a system-internal difference.

Self-reference not being introduced along those lines in §8, it is more difficult for the reader to realize that Luhmann makes use of the very same conceptual apparatus when describing the self-referential operation of communication in a social system. When the reader is told in §10 that communications “involve three selections,” there is no mention that information is hetero-reference, utterance is self-reference and understanding requires distinguishing the two internally. The unity of the three selections is co-created inside the system, and does not exist anywhere else. To make things more difficult, §9 has been inserted in between, and the reader is hastily introduced to the three forms of self-reference: basal self-reference (the self is an element), reflexivity (the self is a process) and reflection (the self is a system). At the end of §9, the reader is then abruptly told that basal self-reference is “the condition that characterizes the autopoiesis of the system.”

Table 1 is an attempt to fill in the blanks and to show how concepts taken from the section under scrutiny, such as basal self-reference (§9), recursive networks (§12), connections (§13) and communication (§10) fit with Luhmann’s statement that “basal self-reference is a constitutive requirement” for autopoiesis (Luhmann 1995: 443).

When the authors write in §14 that “communication emerges as the unit of information and utterance,” we are not told the whole story. Something is missing. What we read in Luhmann is rather that information and utterance “are forced into unity” (Luhmann 1990: 12) and that communication requires the production of an emergent unity” (Luhmann 1993: 774). The gap observed here goes deeper than a choice of vocabulary between “unit” and “unity.” Luhmann does use the two words together in the following sentence: “The unity of a communication is due to the system that reproduces itself by producing units of this kind through a network of units of this kind” (Luhmann 1996: 261). He clearly states in this paper, two paragraphs before the sentence quoted here, that his intention is to relate the concept of communication to a self-referential domain.

In the last paragraph (§14) of the section under scrutiny, the word “meaning” is repeated six times, with an emphasis on “the meaning of communication” and “meaning in the consciousness” and “in the communication.” Luhmann’s warnings about the fact that meaning is constituted and that there are no bits of meaning waiting to be picked up by a system in the environment do not seem to have been really heard. When a meaning-consitituting system makes one selection, it neutralizes and sometimes negates the possibilities that are not actualized in that selection. But it does not eliminate them as possibilities. “The world is not reduced to only what is actually being attended to each time a selection is made,” says Luhmann, “It still remains as the horizon of references, as the horizon of further possibilities, and thus as the domain from which followup selections or further choices are made.” (Luhmann 1987: 177)

If the intended purpose of §§6–14 was to start with the notion of self-reference and to move from there into a closer examination of the autopoiesis of social systems, then the reader has been offered a bumpy ride. To study the workings of meaning-based autopoietic processes may not be an easier path, but it is worth undertaking since it could very well be the condition of possibility for interdisciplinarity.

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The Concept of Autopoiesis: Its Relevance and Consequences for Sociology

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I discuss two aspects of Cadenas & Arnold’s target article. The first concerns some clarifications of the sociological importance of the concept of autopoiesis and the second the criticisms of this concept and its applications in the social sciences.
Luhmann’s solution, considering communication as the basic operation of social systems (Luhmann 1992), tackles both problems. Luhmann defines communication as understanding the difference between information and utterance (§10): communication then takes place only if and when it is understood and this means that its consequences depend on who understands and not on the intentions of the participants. Above all, this implies that communication is an exclusively social operation.

« 3 » If we take the concept of autopoiesis to the extreme, I think it shows an interesting feature: a system is either autopoietic or not. There is no middle way: a system either does not exist (“there is no such thing as creatio ex nihilo.” Therefore, other conditions are needed, which can be described by concepts such as structural coupling (Luhmann 2002b: 118–141; for applications of structural coupling to the observation of law as a social system, although with questionable interpretations of this concept, see also Febbrajo & Harste 2013). This implies that autopoiesis refers only to operations, not to structures. If we define as autopoietic a system able to reproduce its own operations through its own operations, in fact we have not yet said anything about its structures. In other words, while autopoiesis takes place or not, structures may vary considerably depending on the evolution of the (living or social) system. This can be observed in the diversity of life forms, as well as in the various social forms of the past (tribes, ancient judicial procedures, divination, medieval guilds, etc.) and of the present (functional differentiation as a primary societal structure, formal organizations, mass media, etc.).

« 4 » The literature, however, does not always agree with this point. Legal studies (sociology and theory of law) especially have discussed “autopoietic law” in depth (among the many publications, see Teubner 1988). For instance, one may have doubts that a system can really be or remain autopoietic if society imposes local conditions (such as family relationships, diffuse corruption and economic and political pressures) that the system cannot control at all, depending on inputs from other systems. For example, some scholars speak of allopoiesis of law in certain territories (for the case of Brazil, see Neves 1992 and 2001). Or, in a completely different context, Gunther Teubner refers to autopoiesis as a “gradualized concept” (Teubner 1988: 222 and 1989: 38) and distinguishes between autonomy and circularity: while circularity exists or does not exist (“there is no such thing as half circularity,” Teubner 1988: 222), autonomy could be seen as a “gradualized” concept, and observing the evolution of a differentiated system means also observing its becoming more and more autonomous.

« 5 » Luhmann’s objection to the concept of gradual autopoiesis is rather abstract and sophisticated (Luhmann 2002b: 116f). Still, I think it deserves to be elaborated. Luhmann distinguishes between autopoiesis and causal relationships. Autopoiesis does not indicate certain causes that allow the reproduction of a system’s operations. It indicates the mere fact that each operation is followed by another operation. But how this happens cannot be explained by the concept of autopoiesis.

« 6 » The possibility to connect operations with further operations depends on the relationship of the system to its environment, on its ability to build structures and to be irritated by the environment it is dealing with: “The condition of connectivity [Anschlussfähigkeit] does not suffice in order to produce the next state” (Luhmann 2002b: 117f, my translation). Autopoiesis is not a “creatio ex nihilo.” Therefore, other conditions are needed, which can be described by concepts such as structural coupling (Luhmann 2002b: 118–141; for applications of structural coupling to the observation of law as a social system, although with questionable interpretations of this concept, see also Febbrajo & Harste 2013). This implies that autopoiesis refers only to operations, not to structures. If we define as autopoietic a system able to reproduce its own operations through its own operations, in fact we have not yet said anything about its structures. In other words, while autopoiesis takes place or not, structures may vary considerably depending on the evolution of the (living or social) system. This can be observed in the diversity of life forms, as well as in the various social forms of the past (tribes, ancient judicial procedures, divination, medieval guilds, etc.) and of the present (functional differentiation as a primary societal structure, formal organizations, mass media, etc.).

« 7 » Although I generally agree with the arguments of the authors, doubts arise when they write: “The social and the biological concepts of autopoiesis appear then as two facets of the same operational phenomenon” (§51) and take this suggestion as a point of departure for interdisciplinary research (§51f). But it is not clear what this means. The concept of autopoiesis presupposes a clear distinction between different types of systems: an organic system cannot connect its operations with social or psychological operations (in fact, even consciousness is an autopoietic system: Luhmann 1985a) and vice versa. If the different types of autopoiesis are not clearly distinguished, a certain confusion can arise, as one of the texts cited by the authors in §52 shows: Eldridge (2002) speaks actually of behavior rather than of communication as objects of his analysis, although without saying whether he considers them to be elements of the system, in any case refusing to consider institutions such as a court as “an abstract system of communication” (Eldridge 2002: 302). But in what sense an organized “behaviour,” aiming to make judicial decisions, could be something different from communication remains unexplained.

« 8 » Finally, I agree with the authors regarding the philosophical and ideological criticism of the concept of autopoiesis when they quote Danilo Zolo and Jürgen Habermas (§§40–46). To this, I want to add that the problem is always the observer’s position. For example, if one distinguishes between social systems and “lifeworld” (Lebenswelt), as Habermas does, the question arises of where one places oneself. On which side of his distinction should Habermas be placed? He certainly cannot be a social system, otherwise his theory collapses. But neither can he act as a Lebenswelt because for most of his readers he is only a sociologist or a philosopher, an author of books. Should we assume that society is made up of social systems, lifeworlds and Habermas? The same problem arises in the discussion on “the new realism” against constructivism (Ferraris 2014): how can an observer distinguish between reality and construction or interpretation without being God? In the highly sophisticated language of George Spencer Brown (1969), the problem is if and how a distinction re-enters into itself. Is the distinction between a lifeworld and a social system drawn by the lifeworld or by the social system? Or does the distinction between “real reality” and interpretation belong to the reality or to interpretations? I think that in neither case can the questions be answered without ending up in an absurd situation.
There is no doubt that one of the most important theoretical problems of all scientific disciplines, including sociology, is the position of the observers and therefore the quality of the distinction they make (Kauffman 2014). This is the cornerstone of every theoretical development. But we have to admit that, as fascinating these developments are, sociology takes them into account only to a limited extent.

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Authors’ Response
On the Criticisms against the Autopoiesis of Social Systems
Hugo Cadenas & Marcelo Arnold

> Upshot - Firstly, we discuss the main criticisms of our arguments. Secondly, we address the comments and observations on some parts of our article. We conclude with some reflections about the perspectives of the discussion on the autopoiesis concept.

Introduction

1. With very much pleasure, we have read the commentaries on our article and we are grateful to all the commentators for their perusal of our target article. Thanks to their contributions, we can resume this useful debate for the development of systems theory and constructivist thought.

2. In this response we address their criticisms that we consider relevant for the debate and discuss their main points as well as additional issues to clarify our position and to amend our arguments.

Defending the biological theory of autopoiesis

3. We would like to start with the commentary of Humberto Maturana, whom we consider one of the greatest contemporary contributors to the development of systems theory. In his text, Maturana not only restates his original arguments about the social phenomenon but also introduces new ideas and concepts resulting from his recent work with Ximena Dávila. Even though Maturana presents mainly a reaffirmation of his own position rather than direct discussion of our article, we nevertheless believe that it is fruitful to respond to the doubts Maturana has regarding our understanding of his ideas. His main criticism is that our article “does not represent what I have said in my writings” (§1). On the contrary, we would like to emphasize that we do not believe that our reading of his ideas is profoundly misleading, and Maturana’s commentary serves well to reinforce our claims with regard to his concept of the “social.”

4. Maturana’s arguments about the social are a good example of this. He writes that social relations are exclusively “the inner feelings, emotions and doings […] of mutual care, collaboration, honesty, equity and ethics” (§9, emphasis in the original). Maturana considers all other “human relations” as non-social.

5. It does not require any training in sociology to be aware that Maturana’s concept of the social is too narrow. If one wishes to reduce the task of understanding the social phenomenon by focusing only on such a “communitarian” conception of the social – as he clearly does in §13 – one would have to leave out many of the current and past topics of the social sciences. Based on Maturana’s definition, one could argue in favor of certain “ethical” imperatives for life in a good society – similarly to the “discourse ethics” of Jürgen Habermas (1987) – but based on these principles, it is impossible to establish a theory of society with a sufficient level of generality.

6. Although Maturana is a biologist and professedly explains the social phenomenon from the biological perspective, he tries to discuss basic concepts of social sciences. It is there where, unfortunately, Maturana’s ideas do not represent significant progress, precisely because of the lack of dialogue with social sciences. His commentary on our criticism is yet another symptom of this.

7. In contrast to Maturana’s text focusing on the defense of his concept of the “social,” Hugo Urrestarazu aims at a more specific defense of the biological concept of autopoiesis. He points out that our article misses its target since the extension of the concept of autopoiesis to social systems is not justified (§24, §35) because it disregards important aspects of the original theoretical proposal of Varela, Maturana and Uribe (1974) (§8, §9, §35).

8. Although Urrestarazu agrees with our proposal of a “common language” for systems research (§20), he emphasizes the inconvenience of adopting the concept of autopoiesis by social systems theory, i.e., he espouses a defensive position similar to that of Maturana, albeit from a slightly different angle.

9. One might well abandon any attempts to discuss the notion of autopoiesis of social systems, and leave things as they are. After all, the proponents of this concept and their followers brought upon the application of autopoiesis beyond their self-imposed biological boundaries. In this sense, Urrestarazu would be right, and the use that we defend would neither be “justified” (§35) nor “theoretically adequate” (§35) since it does not follow the definition of Varela, Maturana and Uribe (1974) either. In Urrestarazu’s perspective, his canonical reading of the instructions of the creators of the concept is the only legitimate way to read them.

10. Observing the state of the art in social systems research, one can see an entire field of studies dedicated to the autopoiesis of social systems that takes little notice of the restrictions imposed by Maturana and his followers. This is largely due to the fact that scientific research – especially systems research – grows in a heterodox way. Only if an orthodox stance was adopted, would any unauthorized use of a concept appear as “unjustified” or “theoretically inadequate.”

11. From its beginnings, Niklas Luhmann’s theory was such an unorthodox exercise in conceptual construction. Its original concept of social system is based on Talcott Parsons’s ideas but was transformed by means of an equivalence functionalism, as opposed to structural functionalism.
Luhmann's concept of meaning was inspired by Edmund Husserl's phenomenology but understood in the context of the theory of society. His theory of sociocultural evolution follows the ideas of Charles Darwin and Donald Campbell but is embedded in George Spencer Brown's theory of differentiation. All this shows that Luhmann's theoretical construction did not stop at the possible objection of any of the original authors or their followers. So while the path suggested by Unrestarázu is certainly a possible alternative, it is not the only one.

« 12 » Robert King's criticism is very straightforward and full of questions, most of which we think we have already answered in our target article. The question we believe deserves most attention is: "Why do the authors require an autopoietic theory of social systems to unify systems theory?" ($\S7$, emphasis in original). We understand that this is his main criticism. He also criticizes the lack of a "conceptual" clarification ($\S5$) of the reasons for adopting the concept of autopoiesis.

« 13 » The answer to the first question is simple: It is not needed. Furthermore, eliminating any reference to the concept of autopoiesis in the writings of Luhmann would not result in any significant loss. After all, Luhmann introduced this concept at the end of his theoretical work, and many of his ideas can be well understood without any reference to autopoiesis. Nevertheless, such elimination does not seem to be the solution.

« 14 » Systems theory has proven fruitful for the consolidation of a common language for social science. Thanks to the developments of general systems theory and cybernetics, it has been possible to apply a number of concepts coined in these interdisciplinary fields to diverse disciplines. Luhmann's work, as well as the work of others systems theorists in social sciences, such as Talcott Parsons, Gregory Bateson and Walter Buckey, are examples of this. Here, again, while it is not necessary to include the concept of autopoiesis in the broad conceptual reservoir of systems theory, it is fruitful for the development of systems theory itself, the interests of which – according to Norbert Wiener (1948) – include systems from machines up to living beings – a formulation later adopted by Maturana & Varela (1980).

« 15 » As for the second question, the conceptual clarification requested by King was already given in the target article – especially in $\S810$–$14$ – but this may not have been specific enough. So let us elaborate on this a little further.

« 16 » In many social fields such as the closed communication system of the world economy and scientific communication, applying the concept of autopoiesis to social systems can be very useful. In general, it could be argued that the concept of autopoiesis seems to describe properly the functioning of any communication system.

« 17 » Based on this claim we can continue as follows. Autopoiesis requires that the elements of the system have to be produced by the system itself. In social systems operating in the medium meaning, this implies a constant renewal of events that disappear as soon as they appear. A communicative event can only have connection capacity if a system is capable of operating based on these events and ensure their own continuity (Luhmann 1986). The system constantly renews through its own operations what it uses as a unit, and overcomes thus its own difficulties. Thanks to language, i.e., to a limited set of sounds, it is possible to create an infinite world of understandable meaning; thanks to symbolically generalized communication media, it becomes possible to accept highly improbable offers; and thanks to mass media, communication can cross geographical boundaries (Luhmann 2012, 2013a-or-b).

« 18 » The autopoiesis of social systems reflects this constant renewal of elements of a system in the operations of the system itself. Only by means of communication can more communication occur. Thoughts, emotions and environmental states only have meaning in the system when they adopt a communicable form. A communication system can continue without coming to a consensus or a unification of criteria, since the system needs only the continuity of communication.

« 19 » The fact there are critical voices in response to our target article is a clear example of the autopoiesis of scientific communication. It is better not to have a consensus because a consensus would perhaps have less informative value. We are not required to cooperate for a better society or even have the same understanding. A communication system only needs communication, and the system itself provides the means for this continuity.

« 20 » The last criticism we address here can be answered briefly. John Stewart argues in favor of an analysis of the political use of the autopoiesis concept. We have already addressed this matter in the target article (especially in $\S40$–$46$). However, we fail to understand the background of his criticism. The conviction that seems to move Stewart is the political nature of scientific activity. Political communication can relate to the world, as well as to economy, science, law, religion, etc. However, this does not oblige scientific communication to adopt each of these perspectives or, better yet, to qualify some of them as more relevant.

Further aspects

« 21 » Milan Zeleny defends the application of the concept of "social autopoiesis." Zeleny, as was Stafford Beer, is among the earlier proponents of an extension of the autopoiesis to social phenomena. He arrived at a broader understanding of the concept on the basis of computer modeling. For Zeleny, "all living systems must be autopoietic, but not all autopoietic systems have to be alive" ($\S7$). Similarly, any expression of autopoiesis implies a social component. While we agree with his claim, we are concerned by his idea of excluding social systems such as prisons from the scope of autopoiesis. From our perspective, any communication system can be autopoietic, whether authoritarian or not. So Zeleny would need to present more arguments in support of his thesis.

« 22 » Peter Hejl's commentary points at some unclear issues in our target article. Firstly, he rightfully claims that the concept of "distinction" requires further deepening. When we refer to this concept, we follow the nomenclature and explanations of Luhmann. This means that communication, as an operation of observation, is in need of distinguishing and indicating. However, we do not see why this communication concept would imply a "transmission" ($\S6$), as Hejl points out.

« 23 » The second relevant point Hejl makes has to do with the concept of "cooperation" ($\S9\S$). If one accepts, as Hejl does, that cooperation is indispensable for social
life, one should be at least prepared to accept the possibility of conflict as well. Many anthropologists in the twentieth century, such as Bronislaw Malinowski and Franz Boas, showed that whenever cooperation between primitive societies exists, it is mainly in the context of family structures opposing other families. This is as much social as cooperation. However, many questions remain unanswered when one appeals to the argument of cooperation. We agree that a "minimum" concept of cooperation could be of substantial help, for example when explaining the behavior of partners who communicate their understanding. However, what happens if they do not cooperate and still communicate?

With regard to Diane Lafamme's commentary, we cannot help but agree with it. Our article does not delve into the concept of "meaning" of social systems theory, which – as Lafamme points out (§4) – is used in many diverse occasions. It was not a deliberate omission, we must say, but our arguments pointed to other directions, so we do not have to delve into the concept of meaning but can instead focus on discussing the criticisms of the autopoiesis of social systems. Lafamme's excellent explanation on this subject is of great help for a better understanding of the text, as is the table she provides that allows very detailed analysis of the concepts we use.

Finally, for the most part, Giancarlo Corsi's article supports our claim of using the autopoiesis concept in a broader context. In §7, Corsi critically remarks, though, that our wording is confusing when we write "The social and the biological concepts of autopoiesis appear then as two facets of the same operational phenomenon" (§51) because the expression seems to indicate that this is the same operation viewed from two different perspectives. This was not our intention, of course. The autopoiesis of biological systems and that of social systems are not "two-sided" phenomena, but rather two operations in different domains.

Conclusion

We are grateful to have shared our thoughts with such a great group of scholars, who have taken the time to peruse our article. Our response to their criticism does not constitute the final word in the controversies initiated here. The autopoiesis of social systems will certainly continue to be much discussed, so we are pleased to have contributed to it.

As Zelény noted (§15, §18), of the original authors of the concept, only Maturana seems to hold a firm opposition to the application of autopoiesis in social sciences. So it is not surprising that the defense of the biological concept of autopoiesis comes mainly from Maturana and his followers.

For those who do not feel restricted by the canonical use of the concept, we provided arguments in favor of its application beyond biology. Our position is certainly sociological but it can be amended by other developments inspired by systems theory and constructivism in order to contribute to an interdisciplinary debate.

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