erences 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.

« 10 » 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."

« 11 » 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).

« 12 » 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.

« 13 » 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-constituting 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)

« 14 » 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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> Upshot • 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.

« 1 » The concept of autopoiesis is indeed a successful case of abstraction, generalization and respecification (in the sense of Stichweh 1987: 447, quoted by the authors: §50) involving two disciplines very distant from each other: biology and sociology. This concept is important not so much because it "explains" something that has remained unclear so far, but rather because it obliges the social sciences to rethink their tradition and to exclude many of the concepts that are still taken for granted today.

« 2 » First of all, defining social systems as systems recursively reproducing their own elements through their own elements re-opened the old question of what the elements of social systems are. As we know, traditionally there have been two answers two answers: individuals or actions – social actions. In both cases, there have always been problems. On the one hand, defining social systems on the basis of individuals always raises the problem of what is meant by this concept of an individual – its body? Its consciousness? But to describe or even explain how the law, families or formal organizations work, starting with the idea of a set of individuals seems to be challenging. On the other hand, the concept of action has never been defined satisfactorily either. Action refers to the actor and to its intentions, and also to all that can condition them. At the same time, however, nothing of what is social can be explained in terms of someone's intention or will. Therefore additional concepts became necessary, such as the idea of unintended consequences of action (Merton 1936) or evolutionary theory.

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 cannot be "a little" autopoietic, just as a women cannot be a little pregnant (Maturana's example, quoted in Luhmann 2002b: 116). In this sense, autopoiesis as an either/or-concept is the condition of existence of a system, at least for living, conscious and social systems: if there is a system, then it is autopoietic.

« 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 autopoi-

esis 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.[1] 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 presup-

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1 | By structures I mean everything that allows the system to operate. Modern society's structures are the law (courts, constitutions, norms, etc.), the economy (banks, companies, stock markets, etc.), individual careers and so on.

poses 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.

« 9 » 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 keystone of every theoretical development. But we have to admit that, as fascinating these developments are, sociology take 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 frown 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.