(Luhmann 1990b; White et al. 2007), which is intimately linked to notions of distinction, communication, and observation (Karafillidis 2013). Basically all the preceding paragraphs have been trying to lay bare some prerequisites for an understanding of autopoiesis in the space of meaning. Yet the classic validation rules for autopoiesis are developed with reference to physical space. Looking for descriptions of autopoiesis in other spaces makes clear that these rules are not irrevocable. The main difference with respect to autopoiesis validation might now be the injunction to research for an empirically and theoretically plausible operation that is responsible for the self-reproduction of a system.

« 13 » In the case of social systems, Luhmann has chosen communication as operation. He has presented much historical and theoretical evidence across a wide range of topics and subjects to show why this choice is plausible, sociologically productive, and useful. However, he conceived of society as a social system that encompasses (neither physically nor in a Euclidian fashion, to be sure) all other forms of social systems. As a consequence, he had to propose that there are autopoietic systems within society as an autopoietic entity. Though one could suggest that his voluminous studies on functional subsystems are a kind of evidence that this hypothesis might hold, some unresolved sociological issues remain (Maturana & Varela 1987 discussed this issue fleetingly but deliberately left it open). We need not come back to those issues in detail because what is significant here is to point out new developments that circumvent this hypothesis, that is, that do not need to decide whether it is true or false in order to proceed. Rather, the currently emerging theory of social forms treats systems as one form of distinction and assumes that world society is the only autopoietic social system (see Chapter 9 in Karafillidis 2010). We then have only one form of social autopoiesis: society as a system that perpetually computes the local/global conditions of possible further communication. Society is thus neither macro nor micro. It is the self-similar, dispersed, and concurrent reproduction of communication. The emphasis of Varela (1981) and the detailed discussion of Urrestarazu (§§23–32 and passim) on the difference between autopoiesis and autonomy now becomes vital for further research. Henceforth, society might be conceived as the form of social autopoiesis that is highly differentiated into multiple social forms (e.g., organization, family, association, love, discussion, person, city, tribe, nation, gambling, conflict, etc.), each of which participates in society's reproduction. These forms can be autonomous and operationally closed but need not be autopoietic. They do not produce their structural components themselves though they are autonomous in how they select and combine forms and how they determine switchings between forms. Whether it is worthwhile to adopt the distinction of active and passive autonomy (§32) or whether it is even possible to distinguish degrees of robustness of a social form as suggested in §§36f (counting perturbations could prove unfeasible) are open and debatable questions. Urrestarazu's meticulously and densely written piece displays the requisite theoretical scrutiny that facilitates such a debate. In this respect it is indispensable for continuing the work on a theory of (social) autopoiesis.

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Human Autopoiesis?

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> Upshot • It is argued that to define social systems as non-biological is to deny their intrinsic biological groundedness, which affects their complex system dynamics. In the case of human social systems, the ecological phenomenon of human society should not be confused with human social organizations as cultural artifacts.

« 1 » The main problem discussed by Hugo Urrestarazu is whether it is possible to specify physical and components' relational conditions under which some social systems can be properly considered as autopoietic unities. This problem arises if we are inclined, even though intuitively, to view certain complex dynamic systems, such as various kinds of functionally organized groups of autonomous molecular systems (organisms), as living systems. If we are, in fact, inclined to do so, we must assess the autopoietic nature of a complex dynamic system; if our assessment is positive, then this system is a living system. But the question posed by Urrestarazu is whether autopoiesis can be conceived as a domain-free rather than domain-specific concept (§1). This question arises because the original notion of autopoiesis was conceived in an attempt to explain the phenomenon of life within the framework of biology; it is the name of the organization of living systems as discrete autonomous entities that exist as closed networks of molecular production, and it is the necessary and sufficient condition for the constitution of living systems that exist only as long as their autopoietic organization is conserved (Maturana & Varela 1980; Maturana 2002). Defined in this way, autopoietic living systems are biological systems (organisms), and autopoiesis is a domain-specific concept that, for this reason, precludes (at least, on first sight) its application to, for example, social systems.

« 2 » Urrestarazu's premise is that social systems are non-biological systems. Arguing that a social system (as defined in §§50–57) ceases to be mechanistic when applied to human social systems composed of individual agents with high-level cognitive capabilities, he proposes a description of such social systems as communication networks producing collective behavioral patterns (processes) involving coordinated activities performed by multiple agents within some arbitrary regions of space for some arbitrary durations (§§68–70). Such an approach allows a view of a social system as an evolving relational dynamic structure of communicating agents that, at the same time, is a producer of arbitrarily extended and more or less persistent collective behavioral patterns ("CBP entities") among agents. Thus, according to Urrestarazu, a conceptual frame-

work is proposed for representing more general dynamic (meta-cellular) systems endowed with different degrees of autonomy, even if they are not autopoietic (§112).

« 3 » While finding Urrestarazu's arguments succinct, well-structured and convincingly presented, I feel uncomfortable about his claim that social systems are non-biological. In the same way, I cannot see his view of social system (an evolving relational dynamic structure of communicating agents) as entirely original, as it reiterates (at least, conceptually) Humberto Maturana's more explicit approach to social systems as living systems:

> "The manner in which a living system is compounded as a unit of interactions, whether by a single basic unit, or through the aggregation of numerous such units (themselves living systems) that together constitute a larger one (multicellular organisms), or still through the aggregation of their compound units that form self-referring systems of even higher order (insect societies, nations) *is of no significance; what evolves is always a unit of interactions defined by the way in which it maintains its identity*. The evolution of the living systems is the evolution of the niches of the units of interactions defined by their self-referring circular organization, hence, the evolution of the cognitive domains." (Maturana 1970: 4, my emphasis)

« 4 » It would appear that the original notion of autopoiesis – especially with MV&U rules in mind – is, strikingly, at odds with Maturana's notions of different-order living systems represented by monocellular organisms, multicellular organisms and supracellular systems (insect societies, nations). However, "it is not the molecules that compose a living system that make it a living system" (Maturana 2002: 10), it is the condition of being closed molecular dynamics that constitutes living systems as separable entities. Besides, autopoiesis is not an exhaustive condition for a system to qualify as living. According to Maturana (2002), for living to occur at all, two laws of conservation must be satisfied: the law of conservation of organization (autopoiesis) and the law of conservation of adaptation – that is, operational congruence – with the medium in which a living system exists. Thus, living becomes an ecological phenomenon (even though Maturana himself is not explicit on this point).

« 5 » As separable entities, living systems are distinguished by an observer in his observational domain, which is not the physical space of molecules but the space of entities perceived as unities of interactions. Depending on the way in which these entities maintain their identity, their boundaries may be definable – not in terms of the physical space (the "here-and-now" of the observer), but in terms of an evolving relational domain (with Urrestarazu's "arbitrary spatial gaps and temporal lags").

« 6 » Urresatarazu's claim that social systems are non-biological systems appears to be an overstatement inasmuch as each social system is constituted of biological systems as its interacting components. Rather, social systems are not *only* biological; as unities of interactions with the medium operating in the relational domain of social (communicative, in Urrestarazu's sense) interactions, they establish a certain ecological niche that may not be characterized in terms of physical space (cf. §63). Yet, if a bee hive and a nation are viewed as living systems of the same order, one is tempted to ask, "What features in the organization of these systems constitute the difference that makes a difference?" The answer is: language. In the case of humans, their relational domain is constituted by the activity of languaging as a kind of unique, species-specific socially driven behavior. This behavior contributes – in a quite definitive way – to the rich context of the human ecological/cognitive niche, without which it cannot be understood (cf. Ross 2007; Steffensen 2011; Jennings & Thompson 2012).

« 7 » For Urrestarazu, the systemic behavior of human society as a system composed of individual agents with high-level cognitive capabilities depends, primarily, on the cognitive properties of the components themselves since agents' behavior is marked by intentionality and purposefulness (§59), characteristic of autonomous behavior. This claim overlooks the basic ecological nature of human society. Human agents are endowed with high-level cognitive abilities of a different kind than other higher order animals; humans have a predisposition for language as a specific domain of cognitive interactions. Languaging is the constitutive activity of components (individual humans as components of groups of individuals). Its most relevant effects with respect to dynamic system stability (these effects being the emergent phenomena of consciousness and free will) are restricted to a bounded network of linguistic interactions and manifested within the bounds of the composite unity of languaging humans.

« 8 » Human cognitive abilities that set them apart from all other species *emerge* in the process of the development of the system components (infants) into fully functional agents capable of purposefulness and free will. True, the whole systemic behavior of human society depends on the cognitive properties of the components themselves, but these cognitive properties emerge in the domain of languaging (the relations between components) as systemic behavior of human society. Intentionality and purposefulness may *seem* to be the synchronic properties of a system's components. However, what these words in fact describe are specific causality features of the processes (Urrestarazu's "CBP entities," the majority of which would appear to be patterns of linguistic behavior) observed and distinguished by an observer. Viewed diachronically as components of a dynamic system (human society), these processes are the outcome of the relations between the system components, thus meeting the requirements set by VM&U Rule 3.

« 9 » Neglect of the biological groundedness of human social systems results in lack of differentiation between human society as an *ecological phenomenon* and the human social organizations as cultural artifacts; as such, the latter are of purposeful collective human origin and behave according to purposeful actions performed in their regard by human individuals (§89). With this in mind, it is indeed problematic to view human organizations as examples of social autopoiesis, while this would be very appropriate in the case of humans as a complex dynamic system constituted of human individual agents as organism–environment systems (cf. Järvilehto 1998) operating in the cognitive domain of languaging. Linguistic interactions between individual humans are an essential part of the medium with which human adaptive behavior must be congruent. On an evolutionary scale, the relational domain of linguistic interactions as a spe-

cifically human environment becomes an epigenetic mechanism, when extragenomic constraints (the adaptive necessity to orient others and self in a consensual domain of interactions) can induce the same effect as morphogenetic processes – the so-called "Lazy Gene" effect (cf. Deacon 2009). Such relaxation of selection at the organism level may have been a source of many complex synergistic features of the human language capacity, and may help explain why so much language information is "inherited" socially (Deacon 1992).

« 10 » When it comes to humans as a biological species, the evolutionary function of language may be seen to support the epigenetic mechanism responsible for the evolution of hominids into *homo sapiens sapiens,* while ontogenetically its biological function may be seen to constrain the cognitive development of an organism in the organism-environment system. For humans, such a system is constituted of individuals and the relational domain of language; in the biology of cognition, it is a third-order living system (community/society), as compared to first- and second-order systems with lower levels of organization (e.g., single-cell organisms and higher organisms with a nervous system). Taking an ecological perspective, we may speak of linguistic changes as changes in the environment induced by individual organisms that, in return, begin to be influenced by these changes. This takes us to the challenging issue of the relationship between language and mind, if "minded cognition" is what distinguishes human mental capacities from mindless cognition of non-human organisms (cf. Kravchenko 2007) – but this is already beyond the scope of the present discussion.

« 11 » Before asking whether social systems can be described as autopoietic, a distinction must be made between human society as an ecological phenomenon and human social organizations as products of human culture (even though there are a lot of synergies between the two). Using a systems approach developed by Maturana, one does not find it problematic to describe human society as a living system evolving in its cognitive niche defined by the relational domain of language. Once this is understood, the problem of social autopoiesis could be discussed in a new light, becoming more tractable.

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Social Systems: Unearthing the Big Picture

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> Upshot • Although accepting Urrestarazu's view of how autopoietic dynamics can be sought in the domain of the non-living, we see no reason to trace the social to autonomy. Rather, we stress that social systems happen all the time: they arise as people coordinate while also using the peculiarities of human languaging.

Introduction

« 1 » Rather than proclaim that cognition is embodied, embedded and extended, enactivist tradition has begun to pursue how lived experience exploits the social. This leads to a flourishing debate between, on the one hand, Hanne De Jaegher and Ezequiel Di Paolo (2007) and, on the other hand, Pierre Steiner and John Stewart (2009). Whereas the former trace social cognition to how autonomous agents use social contingencies, the latter argue that human autonomy is complemented by heteronomy. Hugo Urrestarazu offers a careful alternative by turning from the logic of sociality to enquire into the abstract properties of social systems. Building on the tradition of Humberto Maturana and Francisco Varela (M&V), he seeks to establish whether, in spite of free will, some social systems might also feature autopoietic organization or, perhaps, "degrees of autonomy" (§§27–40). Based on a clear articulation of the theory's logical implications, Urrestarazu seeks out a "universally acceptable" (§1) answer to the contentious question of the characterization of social systems as autopoietic. By rigorously sticking to the "VM&U Rules," it is clear why one should not ascribe an autopoietic dynamics to either "natural" social systems (§§74–76) or human social organizations (§§87–88). Instead, the author emphasizes the "autonomy manifestation," of both living and social systems – thus breaking with M&V. Not only can the approach clarify the sense in which human social behavior is heteronomous (§§94–99), but it serves as a basis for modeling efficient social structures (§§112–116). On such a view, institutionalized organizations (such as enterprises) can indeed acquire *degrees* of active autonomy.

Making connections

« 2 » Beyond the bounds of cognitive science, there is nothing new about investigating the macro-micro gap or how human life draws on social complexity. This can be traced to a tradition that rejects representationalism for viewing human life as a mosaic of interlocking dimensions: in Ludwig Wittgenstein's (1953) terms, the musical language of living human beings can be pictured in sentences. Emphasis on the latter, Wittgenstein thinks, leads philosophers astray: they reduce language to the dimensions of words and meanings. Offering a multidimensional alternative, Wittgenstein's world is one where *sentences*, *language games* and *forms of life* all intersect and intermesh. Thus a word like "red" is used of a red rose, red hair or red wine: its usage varies across language games, not because of an inner process, but because of how living beings participate in human forms of life. In enactivist terms, observations like these are to be clarified by constructs such as participatory sense-making, heteronomy and/or social systems. One contrast is that while the enactivists seek to reconcile the social with the cognitive,