Chapter 1
Outonomy, the Very Idea

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Abstract The concept of autonomy, as the capacity of a system to govern itself according to its own normativity, is central to modernity. Its theoretical significance spans across various scientific and philosophical fields. Traditionally, however, autonomy has been conceived as arising within the boundaries attributed to the individual in an abstract, internalist and self-sufficient manner. During the last decades, this conception has been challenged at different scales and requires a revision that crosses the boundaries of the individual and takes into account the material embeddedness, open interactivity, and deep interdependency of natural and social phenomena. We propose that autonomous systems are better understood as emerging-from and depending-on different scales of interactivity, collectivity, extensionality, environmentality, and through the lenses of integrativity and sustainability. This updated approach we call *Outonomy*.

Keywords Autonomy · Outonomy · Individuality · Interaction · Integration · Sustainability · Collectivity · Environmentality

1.1 The Concept of Autonomy in the Philosophy of Life, Mind, and Society

The concept of autonomy (*autos* = self, *nomos* = norm) originated in classical Greece and was reborn in modernity, coming to occupy a central place in the conceptual foundations of our societies, human self-understanding, and our comprehension of the living. This notion, often conceptualized as self-determination, refers to the capacity of systems to operate according to their own normativity, in a manner that

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is not reducible-to nor specified-by its environment or constituent components in isolation. Although it has multiple interpretations across philosophical and scientific disciplines, it has traditionally been associated with the rational, self-sufficient individual, emphasising self-governance and independence in Modern thought.

Nowadays, the concept of autonomy is fundamental to account for the defining character of the living (Moreno and Mossio 2015), its origins (Lauber et al. 2021; Shirt-Ediss et al. 2017), and how organisms maintain themselves as cohesive units through change (Bechtel 2007; Ruiz-Mirazo and Moreno 2012), development (Nuño de la Rosa 2010; Bich and Skillings 2024), and evolution (Cortés-García and Etxeberria Agiriano 2023; Walsh 2015). It also acts as a conceptual anchor for the notions of *function* (Christensen and Bickhard 2002; Mossio et al. 2009), *teleology* (Mossio and Bich 2017) and *agency* (Barandiaran et al. 2009) within biological and cognitive sciences, as well as *normativity* with respect to concepts of health and disease (Etxeberria 2016; García and Barandiaran 2025). In *metaphysics* autonomy is key to categorize actions in contrast to mere events (Buss 2014), to naturalize free-will (Newsome 2009; Walter 2001), or to characterize emergence and downward causation in metabolic and neurobehavioural domains (Ruiz-Mirazo and Moreno 1998; Thompson and Varela 2001).

Following the Kantian legacy in *ethics*, autonomy is an analytical and regulative concept strongly associated with the values of freedom (Mele 1995) and responsibility (MacKenzie and Stoljar 2000). In social and *political theory,* autonomy addresses the notion of political subject (Hardt and Negri 2005), the identity of different social systems (Luhmann and Knodt 1996), the collective dimension of emancipation (Zibechi 2007), or the creative and democratic power of the social (Castoriadis 1991; Escobar 2018).

These myriad approaches rarely share the exact same concept of autonomy. But two points are worth making. First, there is a continuous circulation of sources of inspiration, conceptual pollination, and methodological exchanges among all these fields: from biological autonomy to political autonomy (Castoriadis and Varela 1995; Luhmann and Knodt 1996), from biological to cognitive autonomy (Di Paolo et al. 2017), from cognitive to moral autonomy (Korsgaard 2009), from ecological to technological autonomy (Escobar 2018). Second, albeit at varying degrees, and not without conflict, many contemporary approaches continue to gravitate around a robust cluster of properties inherited from modernity: the self-sufficient, internalist, and abstract nature of the individual of which autonomy is predicated (Metzinger 2015; Pinker 2021). This conception of the individual is in crisis, and the concept(s) of autonomy that cut across these disciplines and scales need to address it.

1.2 Contemporary Challenges to Autonomy

Recent advances in the biological and social sciences have raised some fundamental challenges to the concepts of individuality and identity, particularly through the increasing acknowledgement of the interconnectedness and mutual dependence of

natural and social phenomena. As a result, the boundaries of the system become blurry, porous and difficult to identify; pressing the need for a deeper understanding of the biological and social complexity underlying the interactive, relational dimension of autonomy.

The discovery of complex biological associations (symbionts, holobionts, colonies) compels us to reconsider the notion of organism and of individuality (Gilbert et al. 2012, p. 201; Haraway 2016). In cognitive science, the rise of dynamicist, embodied and anti-representationalist approaches (Chemero 2009), along with the expansion of computationalism to include body and environment (Clark and Chalmers 1998) have reshaped the bounds of the cognitive subject, spreading them to living (Lyon et al. 2021) and non-living entities (Hayles 2017).

In the moral dimension, feminist philosophers have rejected (Code 1987), or called for a revision (MacKenzie and Stoljar 2000) of, the individualistic and internalist character of modernity's conception of (masculine) autonomy. They argue that autonomy is "constituted, in large part, by the external, social relations people find themselves in" (Oshana 1998, p. 81), rather than being intrinsic to the rationally self-sufficient individual (Urdangarin and Umerez 2026, this volume). The category of identity in social sciences has also been questioned (Brubaker and Cooper 2000). Similarly, identifying genuine forms of collective autonomous agency remains difficult (Carter et al. 2018), which undermines its application to social ensembles.

Alongside the relative dissolution of the subject,[1] the role of natural and artificial scaffolding in the viability, development, and evolution of autonomous systems has gained recognition (Caporael et al. 2013). The environment is no longer seen as passive but as a complex, dynamic milieu that relationally sustains autonomy (Etxeberria 2026, this volume). Beyond epistemic challenges, contemporary sociotechnical environments jeopardize human and living autonomy. Threats to democratic self-governance and collective agency (Steinhoff 2021; Zuboff 2019) posed by the rising domination of technology and capital which have grown beyond human control (Winner 1978), epitomized by so-called Artificial Intelligence. Similarly, Stengers' "intrusion of Gaia" (2017) highlights how anthropogenic perturbations of the Earth System destabilize the material conditions necessary for the autonomous continuity and reproduction of human societies (Lenton et al. 2020).

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It might be tempting to put into question the very concept of autonomy altogether. But next to these obstacles, we also find new opportunities, theoretical trends and pressing societal and philosophical challenges calling for an updated version of this notion. On the one hand, understanding life, mind, and society beyond the limitations

[1] See, for example, the post-structuralist critique of the subject in the works of Foucault and Derrida, feminist approaches in Butler and Fraser, the moral philosophy of Korsgaard and MacIntyre, biocognitive theories in Canguilhem and Damasio, phenomenological perspectives in Merleau-Ponty and followers, and posthumanist thought in Braidotti. These thinkers collectively challenge traditional notions of the autonomous subject by emphasizing relational, social, and embodied dimensions of agency.

of molecular, genetic, neural, computational or economic reductionism is crucial, especially as personal, collective, and social-ecological challenges demand respect for autonomy in an increasingly hostile context. At the same time, new capacities for addressing those challenges are emerging through the growing availability of digital data, advances in simulation and modelling techniques, and a philosophical shift toward processual, relational, and materialist understandings of life and cognition. Those help transcend traditional dichotomies and develop conceptual resources to support new accounts of autonomy.

In fact, a family of theoretical approaches is well suited to meet the demands of these challenges and opportunities: organicist (Etxeberria and Umerez 2006; Nicholson and Gawne 2015), organizational (Bich 2024; Moreno and Mossio 2015), and enactive (Barandiaran 2017; Stewart et al. 2010; Varela et al. 1991) theories have advanced non-reductive biological, cognitive and social sciences. They share a common tradition in theoretical biology and the naturalizing project it affords. Autonomy is here developed in terms of emergent self-organization, operational closure between interdependent and mutually enabling processes, and the capacity of living systems to regulate themselves both internally and through their environments.

This understanding is linked to the Aristotelian roots of organicism, Spinoza's concept of *conatus*, and Kant's understanding of organisms as self-organized, which underlies German idealism and *Naturphilosophie*. It continued later in a scientific context, as seen in the work of Claude Bernard, Walter B. Cannon, and Kurt Goldstein. Cybernetics and Systems theory paved the way to reintroduce the concepts of *autopoiesis* and autonomy in bio-cognitive sciences (Varela 1979) and their artificial spinoffs: A Life and AI (Boden 1996). From a thermodynamic perspective, Kauffman (2000) characterised autonomy as closure sustaining *work-constraint cycles*. Margulis' symbiogenesis came to fill an important gap within this tradition: that autonomy can be compatible with collaborative relationships and interdependent ontologies. This latter framework is close to what we refer to here as *outonomy*. Aiming to move beyond purely idealized, rationalist views of autonomy, scientific approaches have consistently sought to naturalize the concept by explaining autonomous organization in biological terms—despite Kant's well-known skepticism (Weber and Varela 2002). Together, organismic, organizational, and enactive approaches contribute to a unified vision of autonomy as a dynamic, relational process that is context-dependent and continuously shaped by interactions with the environment. This emerging vision holds promise for advancing also in social, technological and ecological domains.

1.3 Outonomy and Its Properties

Departing from the legacy of modern individualistic views of autonomy, we introduce and elaborate an renewed approach by the term *Outonomy*, after the language game of "out", to break the self-referential appeal of the "autos" (self). In this book, we present outonomy as a further elaboration of the organismic, organizational and enactive

conceptions of autonomy in life, mind, and society. This framework highlights six key properties. Four of them involve expanding beyond individual boundaries towards the environment in the enabling and constitution of autonomy.

1. ***Interactivity****: Autonomy results, not only from internal processes, but also from interactions with the environment and other organisms.* The interactions across membrane, skin, skull, or border that differentiate the individual from its environment are not just resource consumption but active forms of constitution (Etxeberria et al. 2021). Breathing and touching are not simply means to extract oxygen and information from the environment to be internally deployed to produce the individual just by itself, but forms of interaction through which the autonomy of the individual is constituted. Moreover, complex sensorimotor systems also emerge as autonomous processes themselves, further enabling an open interactive dimension extending beyond the individual into the world (Di Paolo et al. 2017; see also Virenque 2026, this volume). Even typically internalist notions, like pain or menstrual health, are ultimately open to social and environmental interactions (see Martínez-Quintero and Rodriguez-Muguruza 2025; Monterde Fuertes 2026, this volume). Autonomy, in this sense, includes specific qualitative forms of interaction. We shall elaborate them next.
2. ***Collectivity****: All forms of autonomy are doubly enabled and restricted by interactions with other agents, forming various assemblages, and opening-up to higher-level autonomous organizations.* From the very origins of life (see Ruiz-Mirazo et al. 2026 this volume) the individual's autonomy is interwoven with that of others. This relational character is particularly evident in inter-organismal reproductive processes (Cortés-García 2026, this volume; Etxeberria et al. 2023), as well as for conceiving the moral and political autonomy of the subject as relational and interdependent (see Urdangarin and Umerez 2026 this volume).
3. ***Extensionality****: Autonomy often (if not always) extends beyond the individual into sedimented structures that are the result of recurrent interactions and those of other autonomous systems.* Technologies and institutions are the most familiar forms of extensionality in humans, but many, if not all, forms of life extend their autonomous processes into their environments. From biofilms in bacteria, to stigmergic structures in insect colonies, or nests in birds, autonomous systems build their environments, organizing the inorganic to extend their autonomy beyond themselves. In some cases, these extensions are so wide and complex, that their increasing autonomy or automaticity hinders that of its creators (see Calleja-López et al. 2026, this volume). In all cases such extensions define relations of co-dependence that produce normative conflicts that challenge the autonomy of the individual in various ways, from oppression (Maiese 2026, this volume) to mental health (García 2026, this volume).
4. ***Environmentality***: *Every autonomous system depends on a larger environment that in turn actively sustains its activities, assemblages and extensions, and which, to a large extent, is constructed by those or other interdependent autonomous systems.* The scale of environmentality situates autonomy within its ecological context, emphasizing the interdependence between agents and their ecosystems.

The environment here is not a passive backdrop but an active and long-term participant in the dynamics of autonomy. As an emergent property of social-ecological systems, autonomy challenges anthropocentric models of governance and advocates for more integrated approaches that account for the interconnectedness of life systems (Cabello et al. 2026, this volume).

The other two properties affect the way of conceiving the self (*autos)* and the normative (*nomos*) aspects of autonomy, across the previous four scales of interaction beyond the individual.

5. ***Integration****: Autonomy manifests through the (degree of) integration of processes that participate in individuation.* The type and degree of this integration serve as good criteria for determining the self or identity of an autonomous system, especially within the messy, fine-grained world of real process interactions. From the outonomy perspective, integration refers to how heterogeneous, interdependent subsystems or components constitute cohesive systems. It involves coordinating the regulation and control of component behaviours such that they contribute to the system´s maintenance (Bich and Bechtel 2026, this volume). It rests to be explored how autonomy could be conceived as a gradual achievement, with integration being a criterion for determining the self or identity of the autonomous system, potentially complementing (or substituting) the concept of closure (whether of constraints, operations, organization, information or otherwise).
6. ***Sustainability****: The normative matrix that characterizes autonomous systems incorporates the care for the sustainability of what is beyond the individual.* Care is understood as the activity that sustains bodies, communities, and environments through a web of life-supporting practices (Puig de la Bellacasa 2017). Autonomy is here reframed to incorporate the inherent precariousness of systems at relational scales that not only support but also demand and implicate individuals and collectivities across multiple levels. This vulnerability takes diverse forms, as considered throughout this volume, ranging from the prebiotic, cellular and organismal scales to human, social and techno-ecological domains.

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