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Defence as a Condition of Autonomy: The Natural Foundations of Human Self-Regulation and Defence

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The ceaseless production of life

ABSTRACT

This article presents defence as a constitutive condition of autonomy grounded in biological organization rather than as a derivative moral or legal category. Beginning with defensive aggression as an evolutionarily conserved, cost-sensitive response when avoidance and escape are insufficient, it traces defence across biological scales as the regulation of viability under disruption. Drawing on autopoiesis, organizational closure, and multilevel regulation, it characterizes living systems as self-preserving through metabolism, homeostasis, repair, immune function, and information integrity. Natural autonomy emerges as environment-coupled self-regulation sustained by natural defence. Human autonomy elaborates these dynamics through predictive control, temporal depth, and cultural scaffolding, yielding human defence as the pre-legal protection of self-regulatory conditions under coercive interference.

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

This article examines the conditions under which autonomy remains viable in environments structured by disruption, coercion, and interference. Human beings, like all living systems, persist only by preserving the integrity of their self-regulatory organization under pressure. The capacity to resist destabilizing forces is therefore not incidental to autonomy but central to its continued existence.

The central claim advanced here is that defence is a constitutive condition of autonomy rather than a secondary moral permission or legal exception. Across biological, cognitive, and human domains, autonomous

systems persist only by preserving the organization of self-regulation under conditions of threat. Defence functions as the mechanism through which autonomy remains viable in adversarial environments.

Beginning at the biological level, the article traces defence as an evolutionarily conserved capacity for maintaining viability when avoidance and escape are insufficient. Cellular repair, immune responses, metabolic regulation, and neural prediction exemplify defensive regulation oriented toward preserving organizational coherence. Defensive aggression emerges within this framework as a cost-sensitive, context-dependent response that stabilizes self-maintenance rather than as pathological behavior.

Natural autonomy is presented as environment-coupled self-regulation sustained by natural defence. When interference alters regulatory trajectories or degrades viability, defensive capacities restore functional organization. Autonomy therefore depends structurally on the ability to resist destabilizing pressures.

Human autonomy elaborates these dynamics through predictive control, temporal depth, and cultural scaffolding. Coercion is defined as viability-degrading interference that disrupts the conditions of reflective agency. Human defence preserves the preconditions of moral agency itself by maintaining the integrity of self-regulation under coercive constraint.

The central implication is that self-defence precedes moral doctrine and legal justification. Law and ethics formalize an already existing biological and agential necessity: the protection of autonomous regulation under threat. Defence is not justified because it is morally permitted; it is morally intelligible because it is structurally required for agency to exist.

2. DEFENSIVE AGGRESSION AS A MODE OF NATURAL DEFENCE

Living systems persist in environments structured by risk, where injury, deprivation, and interference are recurrent features of ordinary existence. Predation, competition, and environmental instability exert continuous pressure on biological integrity, making survival dependent on more than endurance alone. In response, organisms have evolved regulatory strategies that reduce exposure to danger while preserving the internal conditions required for continued functioning. Avoidance, withdrawal, and deterrent signaling dominate this repertoire because they conserve energy, limit injury, and stabilize survival prospects under most conditions. Physical confrontation carries higher metabolic and injury-related costs, and its use reflects strong evolutionary constraint rather than indiscriminate force.[1]

Defensive aggression is treated here as an evolutionarily conserved mode of natural defence that is later reorganized through human cognitive and social capacities. Its biological structure persists across this transition. What changes is the temporal depth and relational scope within which defensive regulation is coordinated. Self-defence later names a normatively evaluated practice situated within moral and juridical frameworks. Defensive aggression remains grounded in biological survival logic.

Across taxa, natural defence encompasses a wide range of protective actions—physiological, behavioural, and social—through which organisms preserve viability under threat. Reflexive withdrawal, defensive displays, evasion, and cooperative behaviours reduce vulnerability and support survival or reproduction. These responses recur across evolutionary lineages, reflecting shared structural challenges rather than species-specific strategies.

Integrated neural and hormonal systems support these behaviours by mobilizing energy, heightening vigilance, and preparing organisms for protective action.[2] In mammals, subcortical fear-and-defence circuits coordinate rapid physiological change. These systems

[1] Niko Tinbergen, The Study of Instinct (Oxford: Clarendon Press, 1951), 132–136; John Maynard Smith, Evolution and the Theory of Games (Cambridge: Cambridge University Press, 1982), 78–82.

[2] Antonio Damasio, Self Comes to Mind: Constructing the Conscious Brain (New York: Pantheon, 2010), 184–190.

enable effective response under acute danger and reflect ancient survival architectures conserved across evolutionary time.

Human beings inherit this biological foundation and extend it through higher-order cognitive capacities. Immediate stress responses remain shared with other animals. Alongside them operate memory, foresight, and representational capacities that allow threats to be anticipated across time. Defensive responses in humans therefore acquire temporal depth. Possible dangers are evaluated in advance, response options rehearsed, and protective strategies prepared prior to direct confrontation. These extensions reorganize natural defence while preserving its underlying biological logic.[3]

A functional distinction separates defensive aggression from predatory or offensive aggression. Predatory aggression is oriented toward resource acquisition, dominance assertion, or instrumental harm. Defensive aggression arises under conditions of perceived threat and remains oriented toward preserving bodily integrity or viability. Ethological research consistently treats this distinction as foundational for understanding aggression across species, reflecting differences in activation conditions, energetic investment, and survival function.[4] [5]

Within the broader survival repertoire, defensive aggression emerges under conditions of failed avoidance. Alongside feeding, fleeing, fighting, and reproducing, it functions as one element within a coordinated system through which organisms manage energy, mitigate threat, and preserve viability [6] Its structure reflects recurrent conditions of vulnerability encountered over evolutionary time.[7]

Defensive aggression therefore designates a conserved natural response through which living systems resist harm under threat. Its biological significance lies in contributing to the conditions under which more complex forms of regulation and autonomy later become possible.[8]

2.1. The Behavioural Architecture of Survival

Long before complex cognition emerged, survival depended on a small set of deeply conserved behavioural patterns. These patterns regulate energy, mitigate threat, and preserve viability. Among them, feeding, fleeing, fighting, and reproducing constitute four foundational strategies shaped through evolutionary time. Across species ranging from insects to primates, these behaviours are embedded within neural, physiological, and hormonal systems that support persistence under conditions of scarcity, danger, and competition. Together, they form a behavioural scaffold through which life maintains itself and responds adaptively to environmental challenge.[9]

Each of these strategies contributes to survival in a distinct yet interdependent manner.[10]

Feeding secures energy and nutrients, the most basic requirements for sustaining life. By fueling metabolism, feeding supports growth, repair, and movement, enabling the full range of adaptive activity. Competition over food resources frequently shapes territorial boundaries and defensive behaviour across species.[11]

Fleeing represents the most widespread and energetically efficient response to immediate danger. Upon threat detection, physiological mobilization prepares the body for escape. Stress hormones surge, muscles prime, attention narrows, and perception

[3] Robert M. Sapolsky, Behave: The Biology of Humans at Our Best and Worst (New York: Penguin Press, 2017), 37–46, 149–156.
[4] Niko Tinbergen, The Study of Instinct (Oxford: Clarendon Press, 1951), 132–136; Konrad Lorenz, On Aggression (New York: Harcourt, Brace & World, 1966), 43–48.
[5] John Maynard Smith, Evolution and the Theory of Games (Cambridge: Cambridge University Press, 1982), 78–82.
[6] Walter B. Cannon, Bodily Changes in Pain, Hunger, Fear and Rage (New York: Appleton, 1915), 210–217.
[7] Ernst Mayr, This Is Biology: The Science of the Living World (Cambridge, MA: Harvard University Press, 1997), 153–158.
[8] Tinbergen, The Study of Instinct, 100–110.
[9] Niko Tinbergen, The Study of Instinct (Oxford: Clarendon Press, 1951), 1–25, 132–136.
[10] Randolph M. Nesse, Good Reasons for Bad Feelings: Insights from the Frontier of Evolutionary Psychiatry (New York: Dutton, 2019), 25–48.
[11] Ernst Mayr, This Is Biology: The Science of the Living World (Cambridge, MA: Harvard University Press, 1997), 147–153.

heightens. This response remains conserved across vertebrate species and continues to play a central role in human self-protection. Avoidance and withdrawal reliably preserve viability under acute threat.[12]

Fighting becomes relevant when escape proves unavailable. In such contexts, defensive force operates as a protective response directed toward safeguarding vital interests such as territory, offspring, or bodily integrity. Sustained combat imposes substantial metabolic and injury-related costs. These costs shape selective pressures that favor conditional escalation and restraint. Ritualized contests, dominance displays, and graded confrontations resolve conflict while conserving energy and reducing injury, preserving resources required for long-term survival.[13]

Reproduction ensures continuity beyond the individual organism and introduces additional vulnerabilities. Dependent offspring require prolonged protection. Reproductive success therefore often demands defensive strategies that extend beyond individual self-preservation. Across taxa, parental care, kin defence, and cooperative breeding practices support offspring survival and enhance long-term viability, embedding defensive regulation within broader biological and social structures.[14]

Within this integrated survival repertoire, defensive aggression occupies a specific functional position. It is activated when avoidance, withdrawal, or deterrence no longer sufficiently reduce threat.[15]

This behavioural logic supplies the immediate context in which defensive aggression becomes intelligible as a regulated component of a coordinated system through which life sustains itself under conditions of vulnerability.

2.2 Defensive Aggression Under Evolutionary Selection

Defensive aggression persists across species because evolutionary processes favored protective responses that enhanced survival and reproductive continuity under recurrent threat. At the population level, traits that increased resistance to injury, deterrence of predation, or protection of vital functions were more likely to be retained through natural selection. Over time, these responses stabilized as reliable components of the biological survival repertoire.[16]

From an evolutionary perspective, defensive aggression functions as an adaptive trait shaped by selection pressures rather than cultural learning or deliberative reasoning. Natural selection preserves traits that contribute to survival and reproduction independently of conscious awareness or intention[17] Organisms expressing effective defensive responses—whether through physical resistance, threat displays, or rapid physiological mobilization—were more likely to survive long enough to reproduce and transmit those traits to subsequent generations.[18]

Classical accounts of instinctive behaviour document this logic clearly. In environments characterized by persistent predation, competition, and environmental hazard, protective responses conferred consistent survival advantages. Across evolutionary time, such responses were differentially retained because organisms lacking effective defensive capacities were less likely to persist.[19]

The adaptive value of defensive aggression extends beyond individual survival. In many species,

[12] Walter B. Cannon, Bodily Changes in Pain, Hunger, Fear and Rage (New York: Appleton, 1915), 210–225.
[13] John Maynard Smith, Evolution and the Theory of Games (Cambridge: Cambridge University Press, 1982), 78–82; Konrad Lorenz, On Aggression (New York: Harcourt, Brace & World, 1966), 43–48.
[14] Tim Clutton-Brock, The Evolution of Parental Care (Princeton, NJ: Princeton University Press, 1991), 55–72; Walter D. Koenig and Janis L. Dickinson, eds., Cooperative Breeding in Vertebrates (Cambridge: Cambridge University Press, 2004), 3–12.
[15] Ernst Mayr, This Is Biology, 153–158.
[16] Charles Darwin, On the Origin of Species (London: John Murray, 1859), 61–6
[17] Ernst Mayr, This Is Biology: The Science of the Living World (Cambridge, MA: Harvard University Press, 1997), 90–97, 153–158.
[18] John Alcock, Animal Behaviour: An Evolutionary Approach, 10th ed. (Sunderland, MA: Sinauer Associates, 2013).
[19] Charles Darwin, The Descent of Man, and Selection in Relation to Sex (London: John Murray, 1871).

defensive responses contribute directly to offspring protection and the preservation of genetically related individuals. These effects enhance reproductive fitness at the level of kin groups. Traits supporting the defence of young, territory, or shared resources were reinforced through their contribution to lineage continuity, even when they imposed immediate energetic or injury-related costs on individual organisms.[20]

Defensive aggression persists because it reliably supported survival and reproductive continuity under recurrent threat.

2.3 Functional Organization of Defensive Aggression

Where evolutionary selection explains why defensive aggression persists, functional organization explains how it is expressed without undermining survival.

Defensive aggression operates as a cost-sensitive response system calibrated to manage threat while minimizing injury and energetic loss. Across species, organisms deploy defensive responses that deter danger while conserving resources. A lizard flaring its body toward a predator, a wasp stinging in response to intrusion, a primate baring its teeth in a threat display, or birds mobbing an intruder exemplify protective behaviours that reduce danger without requiring cognitive planning or intention.[21] These responses arise from survival necessity and reflect evolved coordination rather than hostile motivation.[22]

Physical confrontation imposes substantial metabolic and injury-related costs. Fighting increases the risk of wounding, physiological stress, and mortality, undermining long-term viability.[23] Selection therefore favors conditional responses calibrated to threat intensity and environmental context. Ethological research shows that defensive aggression is frequently delayed, graded, or signaled through warning displays, postural cues, and bluffing behaviours. These signals discourage escalation while conserving energy and reducing harm.[24] Escalation sequences often resolve conflict efficiently and preserve resources required for broader survival demands.[25]

T Formal evolutionary models capture this restraint. Game-theoretic analyses account for the persistence of graded displays, conditional aggression, and withdrawal across populations. These patterns constitute evolutionarily stable solutions that balance deterrence with cost minimization.[26] Behaviours that regulate confrontation without unnecessary escalation increase survival value by limiting injury while maintaining protective capacity. At the genetic level, selection reinforces these patterns because they enhance the long-term propagation of lineages exposed to recurrent threat.[27]

Across ecological contexts, defensive aggression therefore exhibits flexible, cost-sensitive organization shaped by the need to balance deterrence with risk minimization. Its patterned expression reflects evolutionary calibration rather than indiscriminate force.[28] Defensive aggression functions as a biologically organized response system that manages threat while preserving viability within the adaptive architecture of living systems.

2.4 Cognitive Extension of Defensive Regulation in Humans

The cost-sensitive patterns of restraint and escalation described above extend into the human case through additional layers of cognitive organization. Human

[20] W. D. Hamilton, "The Genetical Evolution of Social Behaviour. I," Journal of Theoretical Biology 7, no. 1 (1964): 1–16.
[21] Niko Tinbergen, The Study of Instinct (Oxford: Clarendon Press, 1951), 140–145.
[22] John Alcock, Animal Behaviour: An Evolutionary Approach, 10th ed. (Sunderland, MA: Sinauer Associates, 2013), 281–286.
[23] John Maynard Smith, Evolution and the Theory of Games (Cambridge: Cambridge University Press, 1982), 18–25.
[24] Tinbergen, The Study of Instinct, 145–150.
[25] Alcock, Animal Behaviour, 288–291.
[26] John Maynard Smith, Evolution and the Theory of Games, 24–29.
[27] Richard Dawkins, The Selfish Gene, 30th anniversary ed. (Oxford: Oxford University Press, 2006), 67–73.
[28] John Maynard Smith, Evolution and the Theory of Games, 78–82.

nervous systems mobilize through the same conserved physiological mechanisms—accelerated heart rate, hormonal surges, muscle priming, and narrowed perception—that support immediate defensive responses in other animals.[29] T These responses remain central to rapid threat management and continue to function as the biological substrate of human defence..[30]

In humans, these defensive systems operate alongside expanded cognitive capacities. Memory, anticipation, symbolic representation, and reflective evaluation allow defensive responses to extend across time rather than remaining confined to immediate stimulus conditions. Emotions such as fear and anger continue to function as adaptive programs that mobilize protection, while their expression becomes shaped by learning, social context, and anticipatory modeling of future outcomes. [31] These capacities support advance preparation, regulation of escalation, and coordinated protection within complex social environments.[32]

These higher-order capacities reorganize defensive behaviour while preserving its underlying biological logic. Defensive responses remain constrained by physiological limits, energetic costs, and inherited response patterns. Cultural practices, ethical reflection, and symbolic reasoning structure and modulate these systems by channeling, refining, and coordinating them across social contexts. Evolutionary history continues to shape the boundaries of possible defensive behaviour, even as human cognition expands the temporal and relational horizons within which defence is anticipated and regulated.[33]

From this perspective, biological organization supplies the conditions under which increasingly complex forms of self-regulation become possible. Defensive systems rooted in physiology and cognition establish continuity between basic survival mechanisms and later forms of coordinated action.

Having traced defensive behaviour from its evolutionary organization through its human cognitive extension, the analysis now turns to the internal structural conditions that make such regulation possible at all: the biological organization of living systems themselves.

3. BIOLOGICAL ORGANIZATION AND THE LOGIC OF SELF-PRESERVATION

Living systems persist under conditions that constantly threaten their integrity. Entropy, damage, and environmental fluctuation place continuous pressure on organized life. Survival therefore depends on more than persistence over time. It depends on the capacity to sustain organizational continuity through ongoing internal work. In this structural sense, survival consists in continuous self-maintenance: resisting entropy, repairing damage, and preserving functional integration across changing conditions. [34] Here, “logic” denotes functional dependence within organized self-maintenance rather than purposive intention, deliberation, or evaluative orientation.

This maintenance is constitutive of life itself. Highly ordered biological states endure only by remaining thermodynamically open, drawing in energy and matter while exporting entropy.[35] Viability depends on uninterrupted metabolic and regulatory flows that counteract disintegration. When these processes fail, organizational coherence collapses and the organism

[29] Walter B. Cannon, The Wisdom of the Body (New York: W. W. Norton, 1932), 227–233.
[30] Robert Sapolsky, Why Zebras Don’t Get Ulcers, 3rd ed. (New York: Holt Paperbacks, 2004), 39–45.
[31] Randolph M. Nesse, Good Reasons for Bad Feelings: Insights from the Frontier of Evolutionary Psychiatry (New York: Dutton, 2019), 60–68.
[32] Antonio Damasio, Self Comes to Mind: Constructing the Conscious Brain (New York: Pantheon, 2010), 184–190.
[33] Evan Thompson, Mind in Life: Biology, Phenomenology, and the Sciences of Mind (Cambridge, MA: Harvard University Press, 2007), 158–162; Hans Jonas, The Phenomenon of Life: Toward a Philosophical Biology (New York: Harper & Row, 1966), 84–90.
[34] Evan Thompson, Mind in Life: Biology, Phenomenology, and the Sciences of Mind (Cambridge, MA: Harvard University Press, 2007), 71–78.
[35] Erwin Schrödinger, What Is Life? The Physical Aspect of the Living Cell (Cambridge: Cambridge University Press, 1944), 69–76.

ceases to exist as a living system.[36]

The organization that sustains this coherence is organic in form. Living systems persist through internally coordinated processes that generate, regulate, and repair the very components that make continued existence possible. This self-producing organization is captured by the concept of autopoiesis, which designates the ongoing production and regeneration of the structures that constitute a living system.[37] Autopoiesis identifies how biological systems maintain themselves through organizationally closed networks of activity.

A familiar case illustrates this logic. When tissue is damaged, coordinated immune and reparative processes act immediately to restore integrity and prevent systemic breakdown. These responses operate continuously throughout life and express the organizational activity through which viability is preserved. At this level, biological defence refers to the maintenance-oriented aspects of internal organization—metabolic support, regulation, and repair—through which living systems resist breakdown and sustain organizational continuity. It identifies one indispensable functional dimension within biological autonomy.

This section examines that structural dimension of self-preservation. It introduces self-production and organizational closure as frameworks for understanding how living systems maintain themselves over time, then turns to the concrete biological functions—metabolism, regulation, repair, reproduction, and information integrity—through which this organization is enacted in practice. The analysis shifts from behavioural response to structural condition, showing how the organization of life itself constitutes a continuous and pervasive form of biological defence.

3.1 Living Systems as Self-Maintaining Organizations

Understanding biological self-preservation begins with clarifying what it means for a system to be alive. A living system exists as an organized process that must continually sustain coherence across time. Survival at this level consists in the ongoing maintenance of structure against persistent pressures toward entropy and breakdown.[38]

Living systems persist through continuous exchange with their environments. As thermodynamically open systems, their continued existence depends on the capacity to import energy and matter, export waste, and stabilize internal organization across fluctuating conditions.[39] When this work of maintenance can no longer be sustained, disintegration follows. Biological death, in structural terms, occurs when an organism loses the capacity to preserve functional integration through self-regulating processes.[40]

This capacity for self-maintenance is captured by the concept of autopoiesis, which designates the continuous production and regeneration of the components that constitute a living system.[41] Autopoiesis provides one influential framework for describing this self-maintaining organization and is used here as a model of organizational self-production rather than an exclusive definition of life. It emphasizes that organisms actively generate, regulate, and repair the very elements that make continued existence possible. This activity is sustained through organizational closure: an interdependent, self-referential network of processes in which each function both depends upon and contributes to the operation of the others.[42]

Organizational closure does not imply isolation from

[36] Ilya Prigogine and Isabelle Stengers, Order Out of Chaos: Man's New Dialogue with Nature (New York: Bantam Books, 1984), 128–135.
[37] Humberto R. Maturana and Francisco J. Varela, Autopoiesis and Cognition: The Realization of the Living (Dordrecht: D. Reidel, 1980), 78–85.
[38] Thompson, Mind in Life, 71–78.
[39] Schrödinger, What Is Life?, 69–76.
[40] Prigogine and Stengers, Order Out of Chaos, 128–135.
[41] Maturana and Varela, Autopoiesis and Cognition, 78–85.
[42] Maturana and Varela, *Autopoiesis and Cognition*, 78–103

the environment. It names the internal coherence that allows a system to remain viable while engaging in ongoing exchange with external conditions. [43] Through this coherence, living systems maintain identity across time despite continuous material turnover and environmental disturbance.

From this perspective, life is defined less by material composition than by organizational form. What distinguishes a living system is the coordinated activity of metabolic, regulatory, reparative, and reproductive processes that collectively sustain functional identity across time. [44] The loss of life corresponds to the breakdown of this coordination, when internal processes can no longer compensate for disturbance, repair accumulated damage, or stabilize systemic integrity.[45]

Biological organization, understood in these terms, consists in the continuous maintenance of integrity under conditions of disruption. It names the structural condition through which living systems persist, resist breakdown, and preserve themselves as organized unities over time. At this level, defence refers exclusively to internal preservation and repair. Environment-coupled defence belongs to natural defence and natural autonomy.

3.2 Life-Sustaining Functions of Defensive Organization

Biological organization sustains itself through interdependent functions that enact survival in practice. These functions translate organizational closure into continuous activity—metabolic support, regulation, repair, reproduction, and information integrity. At this level, defence is the continuous functional profile of internal maintenance rather than a discrete response to threat.[46]

Metabolism supplies the energy and material resources required for all life-sustaining activity. Continuous exchange with the environment fuels growth, repair, movement, and regulation. Cellular viability depends on this metabolic flow. When it fails, all other functions collapse. Metabolism therefore provides the energetic basis of preservation by sustaining the conditions of viability.[47]

Regulatory processes preserve internal stability amid environmental variation. Homeostasis stabilizes temperature, pH, and biochemical parameters within viable ranges, enabling organisms to function across changing conditions. [48] Allostasis extends this regulatory logic by mobilizing energy in anticipation of demand, preparing organisms to absorb stress before disruption occurs. [49] Through these complementary mechanisms, regulation buffers disturbance, coordinates response, and sustains functional integrity across time.

Reproduction extends the logic of preservation beyond the individual organism by sustaining organizational continuity across generations. This extension introduces new vulnerabilities that must be actively managed if viability is to persist. Dependent offspring, reproductive partnerships, and kin-based groupings require protective investment to stabilize developmental conditions and secure lineage persistence. Parental care, territorial defence, and cooperative breeding thus function as evolved protective mechanisms that support reproductive success while regulating risk and energetic cost.[50]

Repair and immune functions safeguard biological integrity by detecting, neutralizing, and correcting damage before it destabilizes the system. Tissue repair restores structural function following injury.

[43] Thompson, Mind in Life, 79–86.
[44] Bruce Alberts et al., Molecular Biology of the Cell, 6th ed. (New York: Garland Science, 2014), 510–524.
[45] Hans Jonas, The Phenomenon of Life: Toward a Philosophical Biology (Evanston, IL: Northwestern University Press, 2001), 82–90.
[46] Alberts et al., Molecular Biology of the Cell, 510–524, 680–690.
[47] Alberts et al., Molecular Biology of the Cell, 81–85, 510–524.
[48] Walter B. Cannon, The Wisdom of the Body (New York: W. W. Norton, 1932), 24–32.
[49] Peter Sterling, What Is Health? Allostasis and the Evolution of Human Design (Cambridge, MA: MIT Press, 2020), 15–22; Bruce S. McEwen and Peter J. Gianaros, “Central Role of the Brain in Stress and Adaptation,” Neuropsychopharmacology 35, no. 1 (2010): 105–110.
[50] T. H. Clutton-Brock, The Evolution of Parental Care (Princeton, NJ: Princeton University Press, 1991), 13–27.

Immune mechanisms preserve the distinction between self and non-self that underwrites physiological coherence.[51] Without these processes, disorder would accumulate and progressively undermine survival. Their operation across molecular, cellular, and systemic levels shows how defence is embedded throughout biological organization.

Information integrity preserves the instructions that coordinate life. Genetic fidelity is maintained through DNA proofreading and repair. Proteostasis ensures proper protein folding and function. Molecular chaperones, error-correction mechanisms, and epigenetic regulation stabilize development and adaptation under changing conditions. [52] These systems prevent informational degradation that would otherwise compromise survival and reproduction.

Together, these life-sustaining functions integrate energy flow, informational stability, and structural repair into a resilient biological system. Their coordination enables organisms to absorb disturbance, compensate for local failure, and restore coherence across changing conditions. At this level, defence names the functional logic of internal biological preservation and repair—the continuous architecture of maintenance through which living systems preserve themselves over time.

3.3 Defence as a Multilevel Condition of Viability

The life-sustaining functions described above operate as an integrated system organized across multiple levels of biological complexity. Defence emerges through the coordination of interdependent layers, each supporting and constraining the others within a unified architecture of survival.

At molecular and cellular levels, defensive organization preserves integrity by detecting, correcting, and removing sources of internal disruption. DNA repair maintains genetic fidelity. Proteostasis preserves functional protein structure. Apoptosis eliminates damaged or potentially malignant cells. Autophagy recycles compromised components. Together, these processes prevent local disorder from accumulating into systemic failure. Apoptosis functions as a tumour-suppressive mechanism by sacrificing compromised cells for the stability of the whole[53] Autophagy preserves cellular viability by clearing damaged structures and supporting metabolic balance under stress.[54]

Defence scales upward through systemic coordination. Nervous and endocrine networks integrate detection, evaluation, and mobilization across the organism. Early physiological research identified the autonomic nervous system as a mechanism for rapid internal adjustment in response to environmental change. [55] Subsequent stress research clarified how the hypothalamic–pituitary–adrenal axis mobilizes energy and primes cardiovascular, muscular, and perceptual systems to meet survival demands. [56] Through these coordinated processes, organisms respond to threat in an integrated manner rather than through isolated reactions.

At the behavioural level, defensive organization supports externally enacted regulation. Organisms flee, fight, freeze, bluff, or cooperate in patterns calibrated to situational demands. Ethological research shows that such behaviours are context-sensitive and frequently ritualized, allowing organisms to reduce risk while maintaining defensive effectiveness. [57] B Behaviour translates internal coordination into action, extending biological defence into environmental engagement.

[51] Kenneth Murphy and Casey Weaver, Janeway's Immunobiology, 9th ed. (New York: Garland Science, 2016), 1–12.
[52] Alberts et al., Molecular Biology of the Cell, 510–524, 680–690; Adrian Bird, "Perceptions of Epigenetics," Nature 447, no. 7143 (2007): 396–398.
[53] Douglas Hanahan, "Hallmarks of Cancer: New Dimensions," Cancer Discovery 12, no. 1 (2022): 31–36.
[54] Noboru Mizushima and Beth Levine, "Autophagy in Human Diseases," New England Journal of Medicine 383, no. 16 (2020): 1564–1570.
[55] Cannon, Wisdom of the Body, 24–32.
[56] McEwen and Gianaros, "Central Role of the Brain," 105–110.
[57] Niko Tinbergen, The Study of Instinct (Oxford: Clarendon Press, 1951), 132–141.

Behaviour marks the upper limit of biological defence: internal maintenance expressed outward as flight, display, resistance, or cooperation. Here, "upper biological limit" denotes the maximal known complexity and temporal depth of viability-preserving regulation within biology. When defensive organization becomes systematically environment-coupled—coordinating internal state with external conditions over time—it belongs to natural defence, treated in Section 2, and to natural autonomy, developed in the next section.

These levels are mutually sustaining. Molecular and cellular repair underwrite systemic stability. Systemic coordination enables coherent behaviour. Behavioural success secures the environmental conditions required for lower-level processes to continue functioning. Defence therefore operates as an integrated architecture rather than a collection of discrete mechanisms, binding processes across scales into a unified pattern of persistence that enables organisms to endure, adapt, and act within changing environments.[58]

3.4 Self-Preservation as the Foundational Condition of Survival

The multilevel defensive organization described above converges functionally on a single biological requirement: self-preservation. Every living system must sustain its own organization against persistent pressures toward entropy, damage, and dissolution. Survival, at its most basic level, consists in preserving the organizational continuity that enables ongoing functioning across time.

This requirement is captured by the concept of autopoiesis, which describes the continuous production and regeneration of the components that constitute a living system. Autopoiesis identifies the dynamic through which organisms actively reconstitute the structures that sustain them. Organizational closure specifies how this dynamic is stabilized: the system's processes form a self-reinforcing network in which each function supports the conditions required for the others to persist. Together, these concepts explain how living systems remain thermodynamically open—exchanging energy and matter with their environments—while maintaining organizational identity through internally coordinated activity.[59]

Sustaining this continuity requires selective regulation. Because self-maintenance is resource-limited, organisms cannot respond to all perturbations equally and must filter what matters for viability. Environments are saturated with signals, disturbances, and opportunities, only some of which bear directly on survival. Biological regulation therefore depends on the capacity to discriminate relevance—to filter salience and orient activity toward conditions that support continued self-maintenance. This functional selectivity is captured here by the concept of relevance realization, which describes how living systems dynamically modulate salience-weighting, energy expenditure, and response patterns in relation to survival demands without representing reasons or evaluating outcomes as such.[60] Relevance realization is used here in this minimal biological sense: the system's ongoing capacity to differentially weight conditions by their bearing on viability. This form of normativity remains entirely pre-agential and pre-evaluative, consisting solely in organism-relative conditions of functional success and failure.

Life, viewed through this lens, is an ongoing process of renewal rather than a static condition. To be alive is to continually enact the organizational work that resists disintegration and restores functional stability over time.[61] From this standpoint, biological defence is the continuous activity through which living systems preserve themselves by maintaining the conditions of their own persistence.

[58] Alberts et al., Molecular Biology of the Cell, 81–85.
[59] Maturana and Varela, Autopoiesis and Cognition, 78–103.
[60] John Vervaeke and Todd Anderson, "Relevance Realization and the Emerging Framework in Cognitive Science," Journal of Logic and Computation 23, no. 2 (2013): 355–374.
[61] Thompson, Mind in Life, 79–103.

From this imperative of self-preservation emerges biological autonomy: self-preservation enacted as internally organized self-regulation that sustains identity from within. At this level, survival takes the form of organized self-maintenance rather than mere endurance. This organization prepares the conditions under which internal regulation can later be extended into context-sensitive organism–environment coordination, marking the transition from biological organization toward natural autonomy.

3.5 Biological Autonomy as a Structural Precursor to Natural Autonomy

From the principles of autopoiesis and organizational closure emerges a minimal form of biological autonomy. A living system persists through the organization and regulation of its own processes rather than through external control. Autonomy at this level consists in the capacity to maintain functional integrity by absorbing disturbance, repairing damage, and sustaining internal regulatory continuity across changing conditions.[62] Defence refers here to the preservation- and repair-oriented dimension of biological self-maintenance. Biological autonomy thus characterizes life as a self-organizing process grounded in continuous self-maintenance.

This form of autonomy secures viability without deliberation, intention, or judgment. It operates through organized self-regulation rather than choice or evaluation, maintaining the conditions required for continued existence while furnishing the organizational groundwork upon which more complex capacities may later develop.[63] Across evolutionary history, all enduring living systems instantiate this minimal autonomy, while only some lineages elaborate it into increasingly differentiated modes of interaction, adaptation, and cognition.[64]

Biological autonomy therefore provides the structural ground upon which higher orders of organization become possible. It establishes an internal architecture that stabilizes self-maintenance while permitting increasingly flexible coupling with environmental conditions. The transition from purely internal regulation to context-sensitive coordination marks a shift in how survival is sustained: self-preservation establishes the conditions under which environment-coupled regulation—and thus natural defence—can later emerge. At this stage, viability remains anchored in organizational continuity, even as the conditions for more complex forms of coordination take shape.[65]

Natural autonomy concerns this extended mode of self-preservation, in which biological organization supports ongoing organism–environment coupling while remaining grounded in internal regulation. At this level, autonomy remains structural and functional rather than normative. The present analysis therefore remains confined to the organizational conditions that make later developments possible. Biological autonomy is identified here as the structural ground from which natural autonomy emerges.[66]

4 NATURAL AUTONOMY AND THE SELF-REGULATING ORGANISM

Living systems persist in environments that continually press upon their integrity. Food availability shifts, temperatures fluctuate, competitors encroach, pathogens invade, and injuries accumulate. Survival therefore depends on more than internal maintenance alone. It requires ongoing adjustment to external conditions that can support or undermine continued functioning. Biological autonomy secures viability through internally organized self-maintenance.

Natural autonomy extends that same regulatory logic outward. It names the capacity through which

[62] Maturana and Varela, Autopoiesis and Cognition, 78–85.
[63] Thompson, Mind in Life, 96–103
[64] Francisco J. Varela, Evan Thompson, and Eleanor Rosch, The Embodied Mind: Cognitive Science and Human Experience, rev. ed. (Cambridge, MA: MIT Press, 2017), 172–180.
[65] Xabier E. Barandiaran, Ezequiel A. Di Paolo, and Marieke Rohde, "Defining Agency: Individuality, Normativity, Asymmetry, and Spatio-Temporality in Action," Adaptive Behaviour 17, no. 5 (2009): 367–374.
[66] Thompson, Mind in Life, 104–112.

organisms preserve themselves by coordinating internal organization with environmental conditions as those conditions change over time.

This outward coordination is costly. Monitoring surroundings, recalibrating activity, and responding to variation require sustained energetic investment. Natural autonomy therefore unfolds as an active and effortful process, maintained through continuous regulatory work rather than achieved once and preserved passively.

Natural autonomy concerns viability-preserving regulation enacted through organism–environment coupling. At this level, survival depends on adjusting activity in relation to external conditions that shape the organism's prospects. Regulation unfolds through interaction with surroundings rather than through internal processes alone.

Throughout this section, terms such as *normativity*, *significance*, and *sense-making* are used in a minimal biological sense. They refer to enacted distinctions of better and worse relative to viability, not to reflective reasons, obligations, or moral authority.

4.1 Natural Autonomy as Environment-Coupled Regulation

An organism cannot preserve itself through internal regulation alone once its survival depends on navigating a changing world. Natural autonomy refers to an organism's capacity to regulate itself in relation to environmental conditions that vary over time. Internal self-maintenance remains essential, yet survival increasingly depends on coordinating internal processes with external demands as situations unfold. Regulation at this level remains oriented toward viability rather than reflective choice or deliberation.[67]

Living activity is organized around maintaining form across time. Behaviour and physiology are oriented toward conditions that sustain continued functioning, expressing biological goal-directedness grounded in organizational necessity rather than conscious intention.[68] A familiar illustration appears in bacterial chemotaxis, where movement is continuously modulated by nutrient gradients, coupling metabolic need to environmental structure without deliberation. Natural autonomy is enacted through continuous coupling between organism and environment. Living systems exchange matter, energy, and information with their surroundings in ways that shape internal organization and the niches they inhabit. Through this coupling, organisms preserve identity by adjusting activity in response to environmental variation. *Sense-making* names this dynamic: conditions are encountered as significant relative to viability, guiding regulatory response as situations develop.[69]

This significance arises from the organism's own organization. Living systems differentiate supportive, neutral, and threatening conditions relative to survival demands, encountering environments as structured fields of relevance rather than undifferentiated stimulus arrays. Regulation integrates perception, adjustment, and response within a single adaptive process.[70]

Natural autonomy therefore consists in viability-oriented self-regulation enacted through organism–environment coupling. It names a family of regulatory strategies that admit degrees of temporal depth and coupling complexity, expressing survival as sustained adjustment to what matters for continued existence.

4.2 Scaling Natural Autonomy: From Cells to Ecologies

Environment-coupled regulation appears wherever survival depends on matching internal activity to external variation. Even the simplest organisms exhibit natural autonomy. Single-celled organisms orient toward nutrient gradients and withdraw from

[67] James J. Gibson, The Ecological Approach to Visual Perception (Boston: Houghton Mifflin, 1979), 127–143.
[68] Hans Jonas, The Phenomenon of Life: Toward a Philosophical Biology (New York: Harper & Row, 1966), 79–86.
[69] Jonas, Phenomenon of Life, 83–90.
[70] Francisco J. Varela, Evan Thompson, and Eleanor Rosch, The Embodied Mind: Cognitive Science and Human Experience, rev. ed. (Cambridge, MA: MIT Press, 2017), 172–180.

harmful conditions, coordinating internal metabolism with external variation to sustain viability.[71] At this scale, immediate coupling suffices because environmental change unfolds slowly relative to internal response.

As organisms become multicellular, internal coordination alone becomes insufficient. Regulation must integrate many processes at once while anticipating future demand. Physiological systems mobilize resources in advance, adjusting circulation, metabolism, and sensory readiness in relation to predicted conditions. Research on stress and regulation shows that endocrine and neural systems routinely prepare organisms for future challenges rather than responding only after disruption occurs.[72] These anticipatory adjustments buffer environmental fluctuation and stabilize functioning across time.

With increasing complexity, regulation incorporates memory and experience. Behavioural responses become shaped by prior encounters, allowing organisms to refine engagement with their environments across repeated contexts. Ethological research documents how animals adjust defensive, foraging, and social behaviour in relation to situational cues, coordinating internal state with external conditions in ways that enhance survival.[73]

Natural autonomy also operates across levels within organisms and populations. At the cellular level, immune systems coordinate recognition and response, preserving the distinction between self and non-self that underwrites physiological integrity.[74] At the organismal level, behaviour balances competing survival demands such as feeding, fleeing, and defence. Beyond the individual, cooperative and ecological processes extend regulation into shared environments, shaping niches that stabilize survival over time.[75]

Across these scales, regulatory activity is hierarchically organized. Each level supports and constrains the others, and viability depends on maintaining functional integrity simultaneously at molecular, organismal, and ecological levels. Natural autonomy therefore names a scalable family of self-regulating strategies unified by their orientation toward preserving viability across increasingly complex forms of organism–environment coordination.

4.3 From Reactivity to Adaptive Regulation

Natural autonomy unfolds within a field of biological normativity.
Living systems are organized to sustain themselves, and this organization differentiates conditions that support continued functioning from those that threaten breakdown. Signals such as hunger, pain, fatigue, and stress guide activity by constraining behaviour toward the preservation of functional integrity..[76]

This normativity is enacted through regulation rather than represented in thought. Adjustment unfolds through compensation, modulation, and repair rather than through justification or choice. Biological normativity names the minimal evaluative structure intrinsic to life itself: activity organized around preserving form under changing conditions. [77] Natural autonomy operates entirely within this normative field, grounding regulation without invoking deliberation, responsibility, or moral authority.[78]

At early stages, regulation is reactive. Responses

[71] Varela, Thompson, and Rosch, Embodied Mind, 172–180.
[72] Bruce S. McEwen and Peter J. Gianaros, “Central Role of the Brain in Stress and Adaptation,” Neuropsychopharmacology 35, no. 1 (2010): 105–110; Peter Sterling, What Is Health? Allostasis and the Evolution of Human Design (Cambridge, MA: MIT Press, 2020), 15–22
[73] Bruce S. McEwen and Peter J. Gianaros, “Central Role of the Brain in Stress and Adaptation,” Neuropsychopharmacology 35, no. 1 (2010): 105–110; Peter Sterling, What Is Health? Allostasis and the Evolution of Human Design (Cambridge, MA: MIT Press, 2020), 15–22.
[74] Kenneth Murphy and Casey Weaver, Janeway’s Immunobiology, 9th ed. (New York: Garland Science, 2016), 1–12.
[75] John Odling-Smee, Kevin N. Laland, and Marcus W. Feldman, Niche Construction: The Neglected Process in Evolution (Princeton, NJ: Princeton University Press, 2003), 85–103.
[76] Jonas, Phenomenon of Life (2001), 79–82.
[77] Varela, Thompson, and Rosch, Embodied Mind, 172–176
[78] Jonas, Phenomenon of Life (2001), 83–90.

remain stimulus-bound and temporally narrow: withdrawal from heat, contraction upon contact, or metabolic acceleration under oxygen deprivation. These responses secure immediate survival while remaining confined to the present moment.

Adaptive regulation extends this capacity across time. Rather than responding solely to immediate perturbation, organisms integrate prior exposure, ongoing feedback, and expected conditions in order to preserve viability across extended intervals. Jonas emphasized that living systems are oriented toward maintaining their form over time, a task that requires interpretive adjustment rather than reflex alone.[79]

This progression appears across biological systems. Bacteria alter flagellar rotation in proportion to nutrient gradients, integrating chemical information over time. Birds migrate in anticipation of seasonal change, regulating energy expenditure and reproduction across annual cycles. Mammals cache food in advance of scarcity, drawing upon memory and environmental regularities to stabilize survival beyond immediate conditions.

Adaptive regulation relies on feedback loops and plasticity. Organisms refine their responses through continuous adjustment, improving viability across fluctuating environments. Kandel's work on synaptic plasticity shows how even simple forms of learning modify behaviour in ways that extend survival across time.[80]

Across levels of complexity, signals acquire significance in relation to viability, and regulatory activity is adjusted accordingly. The transition from reactivity to adaptive regulation marks a reorganization of survival itself, from momentary response toward structured engagement with environments that must be navigated, anticipated, and continuously interpreted.[81]

4.4 Environmental Embeddedness and Structural Coupling

An organism remains itself only so long as its engagement with the world does not seize control of its internal regulation. Natural autonomy is inseparable from the environments within which it is exercised. Living systems persist through continuous exchange with their surroundings, importing energy and matter, exporting waste, and maintaining organization against entropic pressure..[82] Environmental embeddedness names this reciprocal condition: regulatory activity unfolds through ongoing interaction with external conditions that sustain or threaten viability.

This embeddedness is active. Environmental features are incorporated into regulatory dynamics through relevance-sensitive processes. Organisms differentiate conditions that bear on survival from those that do not, encountering environmental structures as affordances—features that invite, constrain, or resist action relative to viability.[83] Embeddedness, in this sense, describes how environmental structure becomes functionally integrated into self-regulation.

Such integration appears across biological domains. Plants reorient growth toward light sources, recalibrating hormonal distribution and structural development in response to shifting conditions.[84] n animals, immune regulation depends on ecological relationships, including symbiotic microbial populations whose disruption destabilizes

[79] Jonas, Phenomenon of Life (2001), 82–90.
[80] Eric R. Kandel, "The Molecular Biology of Memory Storage: A Dialogue Between Genes and Synapses," Science 294, no. 5544 (2001): 1030–1038.
[81] John Odling-Smee, Kevin N. Laland, and Marcus W. Feldman, Niche Construction: The Neglected Process in Evolution (Princeton, NJ: Princeton University Press, 2003), 85–103.
[82] Erwin Schrödinger, What Is Life? (1944), 69–76; Jeremy L. England, "Statistical Physics of Self-Replication," Journal of Chemical Physics 139, no. 12 (2013): 121923.
[83] Gibson, Ecological Approach, 127–143; Erik Rietveld and Julian Kiverstein, "A Rich Landscape of Affordances," Ecological Psychology 26, no. 4 (2014): 325–352.
[84] Jirí Friml et al., "Lateral Relocation of Auxin Efflux Regulator PIN3 Mediates Tropism in Arabidopsis," Nature 415, no. 6873 (2002): 806–809.

physiological coherence.[85] Among social species, vigilance, foraging, and defensive behaviour are coordinated through sensitivity to the movements and signals of conspecifics, embedding individual survival within group-level dynamics.[86]

These patterns illustrate structural coupling: organisms and environments mutually shape one another through continuous cycles of action and feedback.[87] Regulation unfolds through this coupling, allowing organisms to sustain themselves by recruiting environmental regularities into their own organizational logic.

4.5 Natural Defence as a Condition of Natural Autonomy

Environment-coupled regulation preserves viability only when internal organization remains intact. Because environments are unstable, competitive, and frequently hostile, natural autonomy depends on the capacity to resist disruption. Natural defence names this capacity. It enables self-regulation to persist under conditions of threat while remaining biological and functional in scope.

Natural autonomy is fragile. Internally organized regulation persists only so long as it is not overridden by external forces. Protective boundaries, repair mechanisms, and defensive responses preserve regulatory independence by preventing invasion, capture, or disintegration. When these protections fail, regulation collapses into externally driven control, where behaviour becomes dictated by external pressures rather than organized from within.[88]

Pathological cases make this dependence visible. Viral pathogens hijack cellular machinery, redirecting metabolic processes toward replication rather than self-maintenance.[89] Autoimmune disorders misdirect defensive functions inward, eroding the self–non-self distinction that underwrites physiological coherence.[90] Cancer represents a complementary failure, where cells evade regulatory constraints and proliferate at the expense of organismal integrity.[91] In each case, fragments of regulation persist while autonomy dissolves through failed defensive coordination.

Defensive regulation carries unavoidable energetic costs. Surveillance, repair, immune activation, and boundary maintenance require sustained metabolic investment. Open systems preserve order through continuous energy dissipation, a principle central to thermodynamic accounts of life.[92] Natural autonomy therefore unfolds under permanent constraint: resources devoted to defence must be balanced against growth, reproduction, and exploration.

Natural defence secures the space within which environment-coupled self-regulation can occur. It anchors autonomy in a world structured by entropy, competition, and threat.

4.6 Evolutionary Expansion of Autonomous Defence

Natural autonomy extends beyond isolated organisms across evolutionary history. Through cooperation and coordination, regulation and defence are distributed across larger units of organization. Selection has favored arrangements in which survival burdens are shared, allowing persistence under conditions that exceed individual capacity. Inclusive fitness theory articulates this logic, explaining how parental care, kin defence, and social alliances embed survival within networks of shared protection.[93]

[85] Yasmine Belkaid and Timothy W. Hand, “Role of the Microbiota in Immunity and Inflammation,” Cell 157, no. 1 (2014): 121–141
[86] Tinbergen, Study of Instinct, 132–141
[87] Varela, Thompson, and Rosch, Embodied Mind, 172–180; Ezequiel A. Di Paolo, Thomas Buhrmann, and Xabier E. Barandiaran, Sensorimotor Life (Cambridge, MA: MIT Press, 2017).
[88] Jonas, Phenomenon of Life (2001), 82–90.
[89] Alberts et al., Molecular Biology of the Cell, 6th ed. (New York: Garland Science, 2014), 1013–1030.
[90] Murphy and Weaver, Janeway’s Immunobiology, 389–402.
[91] Douglas Hanahan and Robert A. Weinberg, “Hallmarks of Cancer: The Next Generation,” Cell 144, no. 5 (2011): 646–674; Hanahan, “Hallmarks of Cancer: New Dimensions,” 31–36.
[92] Prigogine and Stengers, Order Out of Chaos, 128–135
[93] W. D. Hamilton, “The Genetical Evolution of Social Behaviour. I,” Journal of Theoretical Biology 7, no. 1 (1964): 1–16, esp. 1–4.

In vertebrates, parental investment buffers vulnerable offspring against environmental instability, reallocating defensive labour across time and caregivers. In social insects, cooperative defence transforms colonies into regulatory units capable of enduring individual loss while preserving collective coherence.[94]

These developments exemplify major evolutionary transitions, where survival becomes regulated at new organizational levels.. [95] Defence stabilizes these transitions by compensating for increased vulnerability and supporting larger forms of more complex organization under threat.[96] T
At collective levels, defensive coordination grows more complex. Group persistence depends on communication, role differentiation, and synchronized responses to danger. Multilevel selection analyses show that such coordination can be favored when it enhances group viability, even when it constrains individual behavioural latitude.[97]

Natural autonomy therefore functions as a scalable principle. The same regulatory and defensive logic that sustains individual organisms is elaborated through cooperation into increasingly complex systems capable of resisting disruption across broader temporal and spatial horizons.[98]

4.7 Human Beings as the Upper Biological Limit of Natural Autonomy

Natural autonomy reaches its most elaborated biological form in human beings.
Here, self-regulation is extended by memory, anticipation, and symbolic mediation, enabling coordination across complex social and environmental contexts. This elaboration remains continuous with earlier forms of life. Metabolic regulation, immune defence, and organism-wide homeostasis continue to sustain coherence against entropy and disruption.

In humans, viability-oriented, environment-coupled regulation reaches its upper known biological complexity. Human autonomy is that same regulatory capacity brought under reflective, symbolically mediated control across extended temporal and social horizons.

Regulatory activity acquires increased temporal depth and social scaffolding. Sense-making extends beyond immediate contexts, supporting coordination across shared environments structured by language, tools, and cultural practices. These capacities reorganize how regulation is enacted while remaining grounded in the same adaptive logic that governs living systems more generally.

Reflective awareness, deliberation, and normative orientation emerge from self-maintaining and relevance-sensitive processes already present at simpler biological scales. Human autonomy therefore remains dependent upon bodily and cognitive integrity. When these conditions are compromised through injury, coercion, or systemic disruption, the capacity for autonomous regulation correspondingly degrades.

This section establishes the upper biological limit of natural autonomy. It identifies the conditions under which self-regulation becomes increasingly flexible, anticipatory, and socially extended while remaining anchored in viability-preserving organization. Questions of moral agency, responsibility, and ethical authority are reserved for subsequent chapters.[99]

[94] Bert Hölldobler and Edward O. Wilson, The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies (New York: W. W. Norton, 2009), 81–95.
[95] ohn Maynard Smith and Eörs Szathmáry, The Major Transitions in Evolution (Oxford: W. H. Freeman, 1995), 6–16.
[96] Maynard Smith and Szathmáry, Major Transitions, 18–22.
[97] David Sloan Wilson, Darwin's Cathedral: Evolution, Religion, and the Nature of Society (Chicago: University of Chicago Press, 2002), 23–31.
[98] Thompson, Mind in Life, 149–158.
[99] Thompson, Mind in Life, 149–158.

5 HUMAN AUTONOMY AS AN ELABORATED FORM OF SELF-REGULATION

Human life demands a distinctive kind of stability. People carry intentions across days, revise plans midstream, inhibit impulses under pressure, and coordinate with others through language and shared practices. These capacities allow self-regulation to persist across time and social complexity, even as conditions shift.

The preceding sections traced a progression of viability-preserving regulation: from biological organization and internal maintenance through natural autonomy as organism–environment coupling. Human autonomy continues this trajectory. It extends the same regulatory logic into reflective, temporally extended, and socially scaffolded forms of self-governance.

A At this stage, autonomy names a biological achievement: the capacity to monitor, revise, and stabilize one's own regulatory organization across time. Human beings integrate physiological regulation with memory, anticipation, symbolic mediation, and social learning. Self-regulation becomes increasingly self-directed while remaining grounded in biological organization. Human autonomy remains continuous with natural autonomy, differing in degree and organization rather than in kind.

This elaborated capacity depends on enabling conditions. Bodily integrity, affective stability, and a minimally secure environment underwrite reflective control. Disruption at biological, physiological, psychological, or social levels narrows autonomy by limiting the stability and scope of self-regulation. Human autonomy remains a fragile achievement, sustained through ongoing processes of regulation and human defence.

This section clarifies human autonomy as the culmination of adaptive self-regulation. It identifies the internal architecture that enables reflective control, the developmental role of cultural scaffolding, and the dependence of self-governance on preserved conditions of viability. The analysis remains structural and descriptive, preparing the conceptual ground for later chapters in which agency, responsibility, and ethical evaluation are introduced.

5.1 Structural Features of Human Autonomy

Human autonomy begins when regulation becomes able to regulate itself. This section sketches the minimal biological architecture required for reflective self-regulation. It does not offer a complete theory of consciousness or a full account of how shared standards are internalized. Human autonomy preserves the regulatory logic established earlier—viability, coherence, and defensive self-maintenance—while adding a new capacity: regulation can be monitored, revised, and sustained as an organized pattern across time. Biological regulation is reorganized into higher-order self-direction grounded in physiological organization.[100]

Human autonomy emerges when regulatory processes themselves become targets of regulation—when stability, coordination, and defence can be tracked and reorganized over time. This shift gives regulation temporal depth and conceptual flexibility. Internal states, environmental conditions, and projected outcomes can be coordinated across multiple time horizons. Biological normativity is brought under reflective control, allowing regulation to be guided by tracked motives, adjusted priorities, and sustained patterns of action rather than immediate responsiveness alone.[101]

Anticipatory and Reflective Regulation

[100] Evan Thompson, Mind in Life: Biology, Phenomenology, and the Sciences of Mind (Cambridge, MA: Harvard University Press, 2007), 149–158.

[101] Hans Jonas, The Phenomenon of Life: Toward a Philosophical Biology (Evanston, IL: Northwestern University Press, 2001), 82–90.

In human life, reacting after disruption is often too late. Human regulation operates through continual forecasting. Neural systems function as predictive control architectures, coordinating perception and action through recursive feedback between internal expectations and external engagement. [102] This organization stabilizes behaviour in advance of disturbance and enables adaptive adjustment when predictions fail.

Within this architecture, regulation acquires a reflective dimension. Internal models can be monitored and recalibrated, enabling deliberate adjustment of regulatory patterns across time. Executive systems support planning, inhibition, and contextual flexibility, coordinating longer-range aims while constraining impulsive responses. [103] Defensive sensitivity deepens into strategic anticipation: the capacity to identify threats and opportunities early, simulate alternative courses of action, and preserve coherence through foresight and selective adjustment. [104] At this level, defence often appears as anticipatory regulation—the proactive maintenance of coherence through prediction, inhibition, and adaptive planning.

Temporal Depth and Continuity

A human life holds together across time because regulation can remain oriented beyond the present. A defining feature of human autonomy lies in its temporal reach. Experience is organized as a continuous structure linking memory, intention, and projection. Regulation is sustained across past, present, and future, allowing identity to persist through time rather than fragmenting into moment-to-moment responsiveness. [105]

Neural systems supporting sequence, duration, and temporal ordering provide the biological substrate for this continuity. Regulation is no longer confined to immediate circumstances; intentions can persist and plans can be carried through across extended intervals. This continuity supports durable cross-temporal coordination. Projects can be pursued, commitments maintained, and long-range cooperation sustained within social environments. [106] From an adaptive standpoint, this stability functions as a higher-order form of viability, preserving coherence through reliable patterns of action over time.

Conscious Awareness and Self-Modeling

Reflective regulation requires a unified perspective from which conflict and breakdown can become visible. Human autonomy also depends on integrative consciousness. Distributed regulatory processes are bound into a unified field in which perception, emotion, memory, and action become jointly available. [107] Within this integrated field, conflict, incoherence, and breakdown can be perceived by the organism as such, creating conditions for correction and reorganization.

Through conscious awareness, the organism maintains a dynamic model of itself situated within a perceived world. This self-model is embodied and continuously updated through predictive regulation of internal physiological states and external conditions. Self-modeling anchors regulation within a first-person perspective, binding motivation, affect, and cognition into a unified regulatory field. Regulation becomes intelligible to itself, supporting reflective adjustment and stabilization across time. [108]

[102] Karl J. Friston, “The Free-Energy Principle: A Unified Brain Theory?” Nature Reviews Neuroscience 11, no. 2 (2010): 127–138.
[103] Earl K. Miller and Jonathan D. Cohen, “An Integrative Theory of Prefrontal Cortex Function,” Annual Review of Neuroscience 24 (2001): 167–202; Adele Diamond, “Executive Functions,” Annual Review of Psychology 64 (2013): 135–168.
[104] Karl J. Friston et al., “Perceptions as Hypotheses: Saccades as Experiments,” Frontiers in Psychology 3 (2012): 151.
[105] Endel Tulving, “Memory and Consciousness,” Canadian Psychology 26, no. 1 (1985): 1–12.
[106] Michael C. Corballis, The Wandering Mind (Chicago: University of Chicago Press, 2013), 67–92.
[107] Bernard J. Baars, A Cognitive Theory of Consciousness (Cambridge: Cambridge University Press, 1988), 45–74; Stanislas Dehaene, Consciousness and the Brain (New York: Viking, 2014), 91–122.
[108] Thomas Metzinger, “Why Is Consciousness Interesting for Philosophers?” Philosophical Transactions of the Royal Society B 372, no. 1714 (2017): 20160158; Anil K. Seth et al., “Causal Density and Integrated Information as Measures of Conscious Level,” Philosophical Transactions of the Royal Society A 369, no. 1952 (2011): 3748–3767.

Integrative Summary

Anticipatory regulation, temporal continuity, and conscious self-modeling together define a minimal architecture of human autonomy. Each extends a principle already present across living systems—the preservation of coherence under changing conditions—while adding temporal, conceptual, and reflective depth. Together, these capacities provide anticipatory control, cross-temporal stability, and an integrated regulatory perspective: the minimal structural conditions for self-governance.

Human beings maintain viability through a synthesis of prediction, memory, and meaning. Biological regulation becomes capable of monitoring its own course and sustaining coherence through reflective adjustment, while remaining dependent upon biological self-preservation.

5.2 Cultural Scaffolding of Human Autonomy

Human autonomy develops through guided participation before it appears as individual self-direction. Human autonomy develops within social, linguistic, and institutional environments that shape the conditions of self-governance. Capacities supporting autonomous regulation—language, joint attention, imitation, and the internalization of shared practices—are acquired through sustained interaction with others. Higher cognitive functions emerge first in social exchange and are later internalized as individual competencies. Autonomy, on this account, is a cultivated achievement formed through guidance, dialogue, and participation within communities of practice.[109]

This developmental dependence is supported by converging evidence from neuroscience and psychology. Neural systems associated with self-regulation, language, and social cognition mature in close coordination with interpersonal interaction.[110] Research in cultural neuroscience indicates that the brain's functional organization is shaped by the symbolic and social environments in which it develops.[111] These findings preserve continuity with the earlier analysis: cultural environments train and stabilize biological regulation, extending self-regulation into shared symbolic and institutional contexts.

Cultural learning extends this relational foundation into domains of long-range coordination. Human beings possess evolved capacities for aligning goals, coordinating perspectives, and sustaining joint activity within shared practices. [112] Language amplifies these capacities by providing a medium for representation, reflection, and deliberation. Acquiring a language reorganizes attention, categorization, and self-description, reshaping how regulation is structured and sustained across time.

Social institutions further stabilize this developmental achievement by supplying scaffolding for learning, coordination, and predictability. Families, schools, and civic structures transmit skills of planning, inhibition, perspective-taking, and rule-guided action. They also stabilize shared expectations that support long-horizon coordination. Autonomy may later appear, especially in adult self-conceptions, as individual independence. Its exercise continues to rely on relational and institutional conditions internalized through development.

5.3 Human Defence as a Pre-Legal Condition of Autonomy

Human autonomy becomes vulnerable in a distinctive way because other agents can target the conditions that make self-regulation possible. The preceding sections characterized human autonomy as reflective

[109] Lev S. Vygotsky, "Interaction between Learning and Development," in Readings on the Development of Children, ed. Mary Gauvain and Michael Cole (New York: W. H. Freeman, 1978), 34–40.
[110] Michael S. Gazzaniga, "The Social Brain: Discovering the Networks of the Mind," Annual Review of Neuroscience 21 (1998): 423–450.
[111] Shinobu Kitayama and Ayse K. Uskul, "Culture, Mind, and the Brain: Current Evidence and Future Directions," Annual. Review of Psychology 62 (2011): 419–449.
[112] Michael Tomasello et al., "Understanding and Sharing Intentions: The Origins of Cultural Cognition," Behavioural and Brain Sciences 28, no. 5 (2005): 675–735.

self-regulation with temporal depth and cultural scaffolding. This elaboration introduces a corresponding vulnerability. Human beings inhabit environments shaped by ecological variability and by other organisms and agents capable of exerting coercive control over the conditions of self-regulation. Autonomy is exposed to forms of interference that directly destabilize the organization required for sustained self-governance. Human defence names the mode of organization through which autonomy is preserved under such conditions.

Interference with autonomy is encountered at the level of biological, psychological, social, and environmental organization. Coercive disruption arising from the actions of other organisms or agents can compromise regulatory capacity independently of legal recognition or institutional response.[113]

Human defence brings into view the conditions under which autonomy becomes vulnerable to external agency, focusing on how self-regulation is maintained when the supports enabling reflective coordination come under direct pressure.

This pressure is encountered within regulation itself. Coercive interference can destabilize self-regulation by interrupting the biological, affective, or environmental supports on which reflective coordination depends. When such disruption occurs, autonomy can degrade in real time, before protection, adjudication, or third-party intervention becomes available. Legal doctrines of self-defence later formalize responses to these circumstances. Those doctrines presuppose a more basic vulnerability: self-regulation can be overridden by external agency within lived regulation itself. Human defence designates this intermediate organizational space.

The object of human defence is the preservation of the conditions under which autonomous self-regulation remains possible. These conditions include bodily integrity, affective stability, executive coherence, and a minimally secure environment in which reflective coordination can be sustained. Threats to these conditions strain autonomy as a functioning capacity rather than as an abstract status.

Within this domain, force may appear as one regulatory instrument among others. Certain forms of interference cannot be countered through avoidance, withdrawal, or adjustment of engagement alone. Defensive force remains continuous with earlier forms of defensive aggression while reorganized by human capacities for anticipation, coordination, and inhibition. It appears within a graded repertoire of regulatory responses shaped by cost, risk, and situational constraint.

Human defence occupies an intermediate position between natural defence and normatively evaluated self-defence. Natural defence refers to viability-preserving regulation that remains pre-reflective and pre-juridical: it is organized around survival function rather than reasons, responsibility, or publicly shared standards. Legal self-defence, by contrast, is evaluated under articulated rules and institutional authority. Human defence names the autonomy-preserving repertoire that emerges when these same defensive logics are extended by human capacities for anticipation, inhibition, and socially mediated coordination—often shaped by implicit norms and meanings—yet still prior to formal juridical evaluation. Identifying this layer clarifies how autonomy is maintained under coercive interference while preparing the ground for later chapters, where agency, responsibility, and justificatory standards are developed explicitly.

5.4 Fragility of Human Autonomy and Dependence on Self-Preservation

Reflective self-governance rests on biological and affective stability, and those supports can be

[113] The term ‘pre-legal’ here designates conceptual priority rather than historical or normative precedence. The account describes the conditions under which defensive regulation becomes necessary, not the standards by which defensive actions are later evaluated.

disrupted. Human autonomy, elaborated through consciousness and culture, remains grounded in the biological organization that sustains all living systems. Its exercise presupposes bodily integrity, energetic stability, and a minimally secure environment. When these enabling conditions deteriorate through illness, injury, coercion, or sustained deprivation, capacities for deliberation, reflection, and self-regulation diminish accordingly. Autonomy functions as a fragile equilibrium sustained through processes of defence, repair, and physiological regulation.

Neuroscientific evidence indicates that systems supporting executive control, affect regulation, and reflective planning develop in coordination with social cognition and linguistic interaction. Their ongoing function depends on stable physiological conditions.[114] Disruption through chronic stress or deprivation can dysregulate these networks, compromising executive function and narrowing the capacity for sustained self-governance.[115] Psychophysiological research shows that prolonged activation of stress pathways degrades working memory, impulse control, and emotional regulation—capacities central to autonomous action.[116] Reflective agency remains inseparable from bodily and affective coherence.

This vulnerability extends beyond physiology into social conditions. Security of person, predictable environments, and protection from coercive threat form part of the ecological background against which reflective self-regulation can be sustained. Clinical and neuroscientific research on trauma indicates that prolonged exposure to violence, coercion, or chronic insecurity disrupts neural systems responsible for executive control, emotional regulation, and reflective awareness. Behaviour reorganizes around threat management rather than self-directed coordination.[117] Under such conditions, regulation contracts toward reactive accommodation, and autonomy correspondingly narrows.

Within this framework, human defence becomes most visible when enabling conditions deteriorate. Human defence designates the set of biologically, psychologically, and socially mediated processes through which human beings preserve the enabling conditions of reflective self-regulation in the face of destabilizing forces. It operates across levels: maintaining bodily integrity, protecting regulatory capacity, and sustaining the environmental space in which reflective control can be exercised. Here, defence functions as maintenance rather than confrontation—the active preservation of conditions under which deliberation, planning, and self-directed action remain possible.

Recognizing the dependence of autonomy on self-preservation brings the argument full circle. From cellular regulation to culturally mediated self-governance, a continuous defensive logic sustains coherence across scales of organization. In human life, this logic appears as the deliberate protection of one's capacity to regulate, choose, and participate in shared forms of life. Safeguarding bodily, psychological, and social integrity preserves the preconditions under which autonomy can be sustained.

6. CONCLUSION: FROM AUTONOMY TO AGENCY

This article has traced a continuous arc from defensive behaviour to biological organization, natural autonomy, and human self-regulation. Across each level of analysis, a consistent pattern emerges: living systems persist by maintaining coherence under conditions of disruption. Defence appears throughout not as an episodic response to

[114] Michael S. Gazzaniga, "The Social Brain: Discovering the Networks of the Mind," Annual Review of Neuroscience 21 (1998): 423–450.
[115] Bruce S. McEwen and Peter J. Gianaros, "Central Role of the Brain in Stress and Adaptation," Annals of the New York Academy of Sciences 1186 (2010): 190–222.
[116] Amy F. Arnsten, "Stress Signalling Pathways That Impair Prefrontal Cortex Structure and Function," Nature Reviews Neuroscience 10, no. 6 (2009): 410–422.
[117] Bessel A. van der Kolk, "Clinical Implications of Neuroscience Research in PTSD," Annals of the New York Academy of Sciences 1071 (2006): 277–293.

exceptional threat, but as a structural principle through which life preserves itself over time.

Beginning with defensive aggression, the analysis showed that protective responses are evolutionarily conserved and functionally organized to manage threat while regulating energetic cost and risk. Such behaviours form part of a broader survival repertoire through which organisms preserve viability in unstable or hostile environments. Shifting from behaviour to structure, the argument then demonstrated that biological organization itself exhibits a defensive character. Metabolism, regulation, repair, immune function, and information integrity collectively enact a continuous resistance to entropy and breakdown. At this level, defence names the organization of processes through which life maintains itself across time.

On this foundation, the article developed an account of natural autonomy as environmentally coupled self-regulation. Autonomy at this level consists in the capacity to coordinate internal organization with external conditions in ways that preserve viability across changing contexts. Such regulation depends upon defensive integrity. Boundaries, repair, and resistance to disruption preserve the conditions under which regulation remains organized from within rather than overridden by external forces.

Human autonomy represents the most elaborated biological expression of this same logic. Reflective awareness, temporal depth, symbolic mediation, and cultural learning extend self-regulation across time and social space, while remaining dependent upon bodily integrity, affective regulation, and environmental stability. When these conditions deteriorate—through injury, coercion, or sustained disruption—autonomy contracts toward reactive and defensive modes. Human self-governance therefore remains grounded in the same life-preserving architecture that sustains all living systems.

Within this framework, human defence occupies a distinct organizational domain. It concerns the preservation of the biological, psychological, and environmental supports required for sustained autonomous self-regulation under coercive interference arising from the actions of other organisms and agents. This analysis identifies the autonomy-preserving conditions upon which later moral and legal evaluation depends, without itself supplying standards of justification.

Seen in this light, self-defence is derivative rather than foundational. What later appears as legally or morally evaluated self-defence rests upon more basic forms of biological, natural, and human defence through which autonomy is preserved. Defence functions as an enabling condition of autonomy, sustaining the coherence required for self-directed existence. Recognizing this continuity clarifies how autonomy can be sustained, disrupted, or lost, and establishes a naturalized foundation for subsequent analysis of agency, responsibility, and justification—while keeping those normative accounts anchored in the organizational realities of life itself.

The significance of this account lies neither in excusing violence nor in dissolving moral unease about the use of force. Rather, it offers a clearer understanding of why defensive force appears where it does: as a regulated response that emerges when the conditions of autonomous self-regulation are placed under direct threat. Human defence, grounded in the same life-preserving logic that sustains organisms at every level of organization, marks the boundary at which autonomy must be actively maintained in a complex and perilous world.

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Nathan is the Managing Director and Chief Instructor of the Northern Sage Kung Fu Academy, and serves as the Chief Representative of Luo Guang Yu Seven Star Praying Mantis Kung Fu in Canada. Having spent more than twenty-five years living in Shanghai, he is committed to preserving and transmitting traditional martial arts in their most authentic form. Now based in Calgary with his family, Nathan continues to teach and writes regularly on topics of self-defence, combat, health, philosophy, ethics, personal cultivation, and leadership.

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