

Publication status: Not informed by the submitting author

# Metatheorizing Evolutionary Processes for Organisational Cybernetics

Camilo Osejo-Bucheli

<https://doi.org/10.1590/SciELOPreprints.9633>

Submitted on: 2024-08-20

Posted on: 2024-08-22 (version 1)

(YYYY-MM-DD)

The moderation of this preprint received the endorsement of:

William Rojas Rojas (ORCID: <https://orcid.org/0000-0002-1735-8127>)

# Metatheorizing Evolutionary Processes for Organisational Cybernetics.

Camilo Osejo-Bucheli <sup>1 2,\*</sup>

<sup>1</sup> Universidad de Nariño; [camiloosejo@udenar.edu.co](mailto:camiloosejo@udenar.edu.co)

<sup>2</sup> Universidad del Valle; [camilo.osejo@correounivalle.edu.co](mailto:camilo.osejo@correounivalle.edu.co)

\* Orcid <https://orcid.org/0000-0002-6712-6228>

## Abstract:

This article revisits and expands the intersection of evolutionary processes and organizational cybernetics by developing a comprehensive metatheory. While traditional views within the Viable Systems Model (VSM) have often dismissed evolutionary paradigms as deterministic and incompatible with conscious organizational decision-making, this study challenges that notion by integrating key evolutionary concepts such as natural selection, autopoiesis, and symbiosis. Through theoretical synthesis and cybernetic modeling, the research illustrates how these dynamic processes underpin the evolution and adaptation of viable systems. The findings reveal that evolution in cybernetic systems is not merely a process of natural selection but also involves cooperative and symbiotic interactions that are crucial for organizational resilience and adaptability. This research offers a new perspective on evolutionary epistemology within organizational contexts, proposing that the future of organizational theory lies in understanding the complex interplay between competition, cooperation, and self-maintenance. The implications of this study are far-reaching, offering a foundation for future empirical research aimed at exploring the dynamics of organizational evolution and the development of more adaptable and sustainable systems.

**Keywords:** Organisational Cybernetics; Viable Systems Model (VSM); Evolutionary Theory; Autopoiesis; Symbiosis; Cybernetic Modelling

## 0. Introduction

There are some unsolved contradictions between evolutionary processes and organisational cybernetics that warrant revisiting evolutionary theories. Beer's theory centrally links the concept of adaptation to the idea of viability (Beer, 1972, pp. 4-9). Adaptation is the process through which evolution happens (Holland, 1992), and while Beer correctly linked adaptation to evolution (Beer S. , 1972, pág. 6), he argued against the idea that evolution could be an ubiquitous process that influenced viable systems. His refutation of evolutionary theory revolved around the incapacity of the process to generate variety (Beer S. , 1994, pág. 363). Misapplications of Darwin's theory, like Adam Smith's incorrect use of it in social and economic systems, change Darwin's original focus on biological evolution and often support hierarchical structures (Espinosa, Harnden, & Walker, 2008, pág. 11), which Beer's theory goes against.

Previous studies indicate that many academics associated with the Viable Systems Model (VSM) reject the notion that evolution can shape viable systems, despite agreeing with some evolutionary characteristics. Many scholars in organisational cybernetics reject the idea of evolution because they consider it deterministic and incompatible with the conscious decision-making processes of VSM (Osejo-Bucheli, 2023). Others agree that Beer's recursive process is an evolutionary strategy (Espejo R. , 2002) and that institutions and organisations can evolve as social systems (Espejo R. , 2000) but others warn people to be very careful when talking about evolution in terms of social systems (Rawel, 2017).

Conversely, recent studies support the idea that the evolutionary process is congruent with the Viable Systems Model (VSM). The discourse on the nature of viable systems has shifted, suggesting an inherent connection between these systems and Complex Adaptive Systems (CAS) (Espinosa, Harnden, & Walker, 2008). Evolutionary processes are central to the study of CAS (Holland, 1992; Kauffman, 1993). Academics at VSM have found that the co-evolution of the system and the environment is crucial for sustainability

(Espinosa, Harnden, & Walker, 2008; Espinosa A. , 2023). Furthermore, some scholars urge readers to consider evolutionary mechanisms as self-regulation mechanisms in people and organisations (Espinosa, Harnden, & Walker, 2007). Others have discovered that evolution in these systems is a combination of natural self-organising processes and human interventions aimed at steering social processes according to collective purposes and values (Espejo R. , 2004). Other streams of cybernetic thinking have turned to the evolution of technology to access evolution as both an epistemology and a methodology (Osejo-Bucheli, 2024a; Simondon, 2017).

To illuminate this important issue and improve our understanding of evolution, we have set our goal to examine evolutionary theories and unify them on a metatheory that allows us to discover the metaphors about dynamic processes and study organisational systems as a process-oriented epistemological framework. A cybernetic evolutionary metatheory does not aim to explain the diversity of species or the increase in complexity in organisms (Räwel, 2020; Darwin, 1885; Maturana-Romesín & Mpodozis, 2000), as it does in biology. Instead, it aims to comprehend the approaches that these theories have taken to understanding the evolutionary process. These ways of thinking help us figure out the basic assumptions that every evolutionary contribution is based on. They also establish a basis for examining the application of evolutionary theory and cybernetics in understanding the functioning of organisations.

Contrary to common assumptions, our findings suggest that evolutionary theories have strong cybernetic and processual underpinnings. It revealed the deeply engrained cybernetic approach to evolutionary theories, given that they rely on explaining reciprocal-cause and control dynamics. Furthermore, our research locates these phenomena in natural selection, which is the dominant theory. Additionally, this research identified a processual nature that underlies all the evolutionary theories, given that it deals with events that materialise over time, unveiling principles applicable universally to the evolution of social systems.

Our findings contribute to the proposal for an evolutionary epistemology for organisational systems, which aligns with Beer's (1994) proposal and incorporates other evolutionary theories originated in alternative cybernetic branches. They propose to comprehend not only the selective effects on evolution but also the discoveries about autopoiesis, homeostasis, cooperation, symbiosis, and other subprocesses of the evolutionary process from a cybernetic perspective. As a result, cybernetic modelling has proven to be a strong theoretical synthesis tool with which we formulate our metatheory. Our analysis challenged the commonly

held underlying suppositions that evolutionary theory suggests ethical competition and that the imposition of the strongest evolution implies association, cooperation, and collaboration.

## 1. Materials and Methods

The methodological section contains: first, a presentation of the study's general design; second, a discussion of the selection process for the theories analysed; Third, a discussion and presentation of the metatheorisation approach; Fourth, we introduce the unification technique, known as cybernetic modelling, a methodology we inherited from Beer (1999).

### 1.3. Perspective on metatheorisation.

By metatheory, we mean a theoretical structure that groups several theories. In general, "meta" means "after," "over," "beyond," "occur later," and "in succession" to "preceding activities," the "beyond, transcendent" (Zhao, 1991). Since epistemology and ontology make up the "meta-theoretical assumptions" of theories, metatheory sets the intellectual boundaries of research by defining the social and political universe and what constitutes valid knowledge (Reus-Smit, 2013). According to Ritzer (1990), sociology theory studies the world, whereas metatheory studies theory. Therefore, metatheory is the study of how to integrate it in a broad sense. It also includes the creation and use of analysis theorems that show what assumptions are behind theory and theorising (Wallis, 2010). A metatheorem reflects the coherence between epistemology and the objects of knowledge (Sklair, 1988). From systemic perspectives, there are many opportunities and challenges for the development of metatheory as a science (Wallis, 2010).

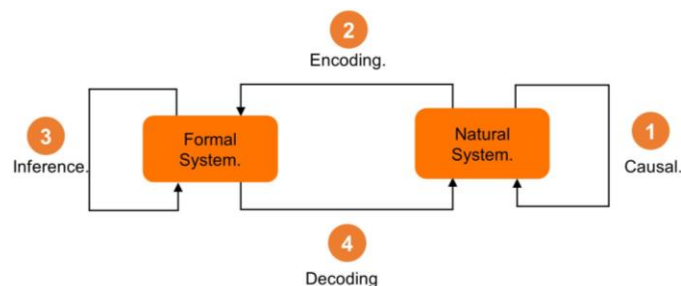
Natural selection is the underlying supposition in evolutionary theories. The evolutionary process explains the spontaneous emergence of order, complexity, variety, and specialisation in nature (Kauffman, 1993). Evolution is a ubiquitous process, so much so that many consider it a natural law. By the end of the nineteenth century, scholars rarely questioned the theory of evolution, but they couldn't agree on how evolution occurs (Bowler, 1983). Evolution by natural selection, or Darwinian evolution, is the dominant evolutionary theory. For many academics, including Beer, evolution is synonymous with natural selection (1994; 1979; 1972). Similarly, for scholars working on complex adaptive systems, evolution by natural selection is the only evolutionary theory of study (Holland, 1992); (Kauffman, 1993) . Natural selection, according to

evolutionary epistemology (Campbell, 1997), is the only explanation for an organism's traits; this is particularly important because it excludes other evolutionary theory variants, such as those that propose evolution as a result of behaviour.

#### 1.4. Modelling as a unifying language

We use cybernetic modelling as the conceptual language. Second-order cybernetics uses models to investigate the interactions between systems and their surroundings. Models based on sense-captured data are incomplete, dull depictions of nature (Beer S. , 1993, pág. 20). Cybernetics accepts numerous diagrams, electrical representations, and mathematical models (Ashby W. , 1956). Analyse alternatives and test models for the intended use (Conant & Ashby, 1970). Modelling the system, its behaviour, and its structure is necessary for solving both static and dynamic systems (Klir & Valach, 1965). Figure 2 illustrates a modelling logic that Rosen (2012) proposed for anticipatory systems. The model demonstrates how natural systems carry out their identity-determining tasks through causal entailment. A formal system represents the natural system by encoding it. The formal system model predicts the natural system's behaviour. We validate these predictions by decoding them against the natural system. This procedure demonstrates the effectiveness of formal system modelling. To deal with variety (Beer S. , 1993, pág. 20), systems use models as patterns.

Figure 2. Anticipatory systems, source: adapted from Rosen (2012, págs. 313-370).



The models proposed in this article combine the block diagrams used by Klir G. J. (1985), widely used by cyberneticians for representing processes, infused with the symbols used in electric schematics, as inspired by Beer (1975; 1993). In the schematics and models, the star symbol (★) represents the world's source of variability (Beer S. , 1975); the ground symbol (⏏) represents the return of energy within a system to its environment as it perishes; the amplifier (▷) increases variety; and the attenuator (⏏) decreases variety as it passes through it.

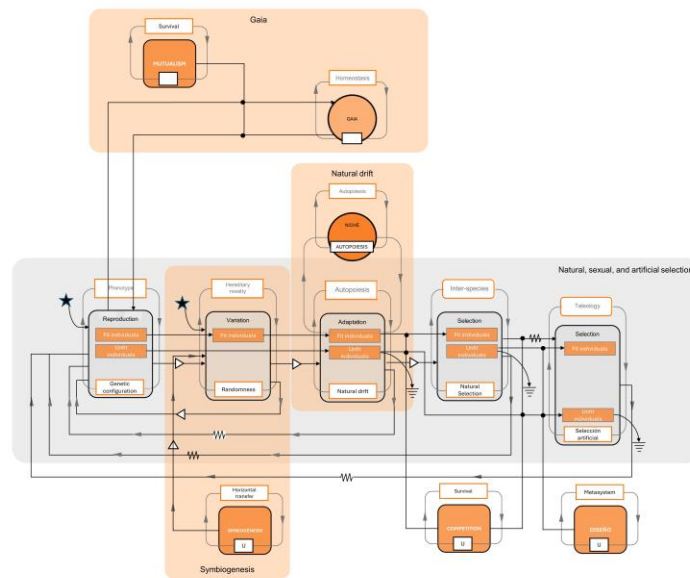
This provides a platform for two further developments: first, a mapping of evolutionary theoretical proposals based on cybernetics or systems theory. This mapping enables the identification of contributions to each function of the evolutionary process, serving as a foundation for future proposals. Secondly, it enables us to distinguish the unique contributions of each evolutionary theory, thereby enhancing the authors' suggested approaches. Organisational systems have evolved. The following is an outline of those proposals for future developments.

## 2. Findings: Analysis and Modelling of the Evolutionary Theories

### 2.7. The cybernetic model of evolutionary metatheory

The purpose of this paper is to identify an evolutionary metatheory in cybernetic terms. Figure 11 consolidates the core concepts and their interrelationships, along with a panorama of the theories presented in the previous title, thereby fulfilling a portion of the paper's purpose. The figure should not need further explanation.

Figure 10. The current state of the evolutionary process; *source*: this research



*Note:* The area coloured in pale orange in the figure shows the step of the evolutionary algorithm this theory produces its most important contribution. All other conventions are maintained as in previous figures.

## 2.8. Towards an evolutionary cybernetic epistemology

In this article's purpose statement, we committed to formulating epistemological premises based on the evolutionary dynamic processes identified in the metatheory in the last section. Below, we list the processes and describe their dynamics.

### Teleallopoiesis:

This dynamic describes the intervention of an external agent into the system's production. Similar to sexual and artificial selection, deliberate selection maintains some traits, leading to purposeful evolution. In enterprises and institutions, minimising the input leads to maximising the output.

### Accretopoiesis:

This dynamic indicates evolution by accumulating changes. Through this process, a system's structure grows from substratum to substratum. In nature, stalagmites grow in length, and pearls grow in diameter, parting from a grain of sand. Organisational systems select and accumulate learning, forming a corpus that is useful to the organisation (Espinosa, Harnden, & Walker, 2007).

### Consolidation nexus:

This dynamic refers to the gradual reduction of entropy through the tendency to form larger and more complex conglomerates. In nature, the formation of shoals, herds, packs, swarms, and so on diminishes the risk of reducing a group's genetic pool by losing individuals to predators. In the case of predators, a pack of wolves or a pod of dolphins will diminish the effort and increase effectiveness in hunting; in the case of flocks travelling, the spear head formation reduces air resistance, etc. Groups and conglomerates' negotiating power reduces price variability in organisational systems, requiring fewer resources and improving benefits.

### Algorithmic homeostasis:

This is a process that involves continuous stabilisation over time through repetitive, recurring behaviour. Depending on the chosen time frame for study, the concept of algorithmic homeostasis may resemble the traditional understanding of control in cybernetics. In living systems, the way populations adapt to

the availability or scarcity of resources and the presence or absence of predators by growing and shrinking 211  
is an example. This dynamic, known as the bullwhip effect in enterprises, arises from the discrepancy be- 212  
tween purchase requirements and provider ordering over time. 213

Synergistic enclosure: 214  
215

This dynamic occurs when the environment supports a niche and the niche supports the system; 216  
additionally, the system typically serves as an environment for smaller subsystems. In nature, there is a 217  
straightforward analogy with the earth's environment, which turns into a niche where species live. In organ- 218  
isational systems, the preferred example is the viable system, where smaller viable subsystems form the 219  
larger one. 220

Cooperative convergence: 221  
222

The process describes how two dissimilar systems engage in interactions for the mutual benefit of 223  
adaptation to the environment. Sometimes this process even changes the environment for mutual benefit. 224  
There is no coupling between the two original systems. Lovelock's (1979) study provides the most prominent 225  
examples of this process. This principle forms the foundation for cooperative associations in organisational 226  
systems, with buyer's coops serving as clear examples. Most cooperative models identify this process as a 227  
principle for their members. 228

Symbiotic autopoiesis: 229  
230

The process describes the achievement of adaptation and self-production through symbiosis. Margu- 231  
lis (1998) and others present examples of this nature. In organisational systems, beer discusses the symbiotic 232  
relationship between the human brain and computer, as well as the interaction between individuals to form 233  
the central control room within the organisation. 234

Transduction: 235  
236

This is the process of converting information into a different form or transforming it into a material 237  
expression. During reproduction, residual ADN enters the nucleus of a cell and replicates with the original 238  
material. In organisational systems, an example could be when, in a hospital, healthcare personnel translate 239  
the information from their professional work into administrative information. Consider the scenario where 240  
a builder converts an architect's plans into a physical structure. 241

Aesthetic Coherence:

243

This term refers to a process that achieves order and stability through the harmonious application of aesthetic principles and beauty. Dutton (2009) narrates a natural example, revealing that humans naturally gravitate towards landscapes that are more conducive to their subsistence. Dutton (2009) provides a natural example, revealing that humans naturally gravitate towards landscapes that are more conducive to their subsistence needs. In organisations, the aesthetic experience reinforces identity and group cohesion (Osejo-Bucheli C. , 2022); furthermore, enterprises related to ludic strongly relate to aesthetics (Saldaña Rosas & Aguilar Contreras, 2021).

244

245

246

247

248

249

250

251

The second part presents what we called the evolutionary process table. Table 2 presents the epistemological findings in terms of the processes identified in the metatheory. Following the assigned name in the first column, we provide a brief explanation of the process under the dynamics heading in the second column. In the third column, we showcase the philosophical implications, encompassing the values, principles, and overall ethics that stem from the identified process. The next column, "Implications for Research," talks about the new ways that evolutionary process approaches can be used in cybernetics research. The next column suggests a possible research topic for this approach, and the last four columns suggest an approach, design, analytical, and empirical methods for a possible research project.

252

253

254

255

256

257

258

259

260

Table 2. Evolutionary processes table; *source*: this research.

261

262

| Process                | Dynamic                              | Implications for philosophy of organizational cybernetics     | Implication for research in organizational cybernetics.      | Potential subjects of study | Approach descriptive, explicative, normative, prescriptive | Research design                              | Analytical methods     | Empirical methods                    |
|------------------------|--------------------------------------|---|--|-----------------------------|--|--|------------------------|--------------------------------------|
| Purposeful Allopoiesis | Purposeful intervention on evolution | Implies a comparative improvement                             | Integration of operational research through evolution        | Optimisation in operation   | Prescriptive   | Mixed methods, mostly qualitative            | Purposeful Allopoiesis | Purposeful intervention on evolution |
| Accretio- poiesis      | Accumulation of traits               | Entails the accumulation of desired characteristics over time | Identification of desired and undesired attributes over time | Organisational learning     | Descriptive and normative                                  | Mixed methods, Explanatory sequential design | Differentiation        | Observation                          |

|                         |   |   |   |   |  |                            |   |  |
|-------------------------|---|---|---|---|--|----------------------------|---|--|
| Consolidation nexus     | Progressive reduction of entropy through unity  | Tendency to form single unities   | Identification of the converse dynamic of recursion                                       | Merging                                   | Normative                                  | Case study                 | Consolidation nexus                             | Progressive reduction of entropy through unity         |
| Algorithmic homeostasis | Relation of processes with stabilisation through time.                                | Anti-oscillatory effect and recurring behaviours                                | Identification of cyclical events or recurring sequences on phenomena                     | Environmental disturbances                | Explicative                                | Process research           | Algorithmic homeostasis                         | Relation of processes with stabilisation through time. |
| Synergistic enclosure   | A homeostatic relationship with the environment, and a formation of a new environment | Interdependence, cocreation, complementarity relation of system and environment | Identification of concentric symbiosis, and   | Organisational structure                  | Explicative, and normative                 | Case study                 | Systems and cybernetic modelling                | Observation  |
| Cooperative convergence | Equilibrium through association   | Prescribe chain association and mutualism                                       | Evaluation of possible systemic integrations  | Negotiation, relationship and integration | Descriptive                                | Multicase study            | Grounded methods                                | Observation, archival, interviews                      |
| Symbiotic autopoiesis   | Tendency to the auto production through mutualism.                                    | Tendency to coevolve  | Identification of the tendencies to consolidate a symbiotic relationship                  | Organisational and structure design       | Descriptive, explicative, and prescriptive | Longitudinal               | Symbiotic autopoiesis                           | Tendency to the auto production through mutualism.     |
| Transduction            | Transformation of information   | Process underlies and is beyond idea and matter                                 | Describe the relationship between information and matter and vice versa                   | Systems changes related to information.   | Explicative and normative                  | Convergent parallel design | Quali and quantitative analysis and integration | Separate quantitative and qualitative data collection  |
| Harmonic stabilisation  | The tendency to reduce entropy through looking for aesthetic experience               | Natural preference of aesthetics  | Describe the organisational implications of equilibrium, harmony, symmetry and proportion | Aesthetic experience in management        | Descriptive, explicative and normative     | Case study or multicase    | Comparative analysis<br>Grounded methods        | Observation, participative observation.                |

**3. Discussion**

Our findings significantly contribute to the ongoing discourse on evolutionary epistemology within the context of organizational cybernetics. By integrating dynamic processes such as natural selection, autopoiesis, and symbiosis into a unified metatheory, we offer a more comprehensive understanding of how viable systems evolve and adapt. This research challenges the static interpretations traditionally associated with the Viable Systems Model (VSM), emphasizing instead the fluid and adaptive nature of organizational evolution. The study reveals that evolutionary processes in cybernetic systems are not solely governed by natural selection but also involve cooperative and symbiotic interactions that enhance systemic resilience and adaptability. These findings align with and extend the work of Jdanko (1988) and Campbell (1974), offering new insights into the complex dynamics that drive organizational viability in changing environments.

266

267

268

269

270

271

272

273

274

275

276

#### 4. Conclusion

277

278

This study provides a robust theoretical framework that bridges evolutionary theory and organizational cybernetics, highlighting the critical role of dynamic processes such as autopoiesis, symbiosis, and homeostasis in organizational evolution. Our research underscores the importance of viewing evolution in cybernetic systems as a multifaceted process that goes beyond natural selection to include cooperative and symbiotic dynamics that are vital for the sustainability and adaptability of viable systems. These insights have significant implications for both theory and practice, suggesting that future research should continue to explore the interplay between these processes to better understand and support the evolution of complex organizational systems. By advancing our understanding of these dynamics, this study paves the way for more nuanced and effective approaches to managing organizational change and development in increasingly complex and interdependent environments.

279

280

281

282

283

284

285

286

287

288

289

#### 7. References

290

- Ashby, W. (1956). *Introduction to Cybernetics*. New York, NY.: Wiley. Retrieved from [http://documents.irevues.inist.fr/bitstream/handle/2042/30159/XX\\_CNE-LIPSOR\\_000704.pdf?sequence=1](http://documents.irevues.inist.fr/bitstream/handle/2042/30159/XX_CNE-LIPSOR_000704.pdf?sequence=1)
- Beer, S. (1972). *Brain of the firm*. Devon: Wiley. Retrieved from [https://scholar.google.com/scholar\\_url?url=https://agris.fao.org/agris-search/search.do%3FrecordID%3DUS201300488705&hl=es&sa=T&oi=gsb&ct=res&cd=1&d=64595](https://scholar.google.com/scholar_url?url=https://agris.fao.org/agris-search/search.do%3FrecordID%3DUS201300488705&hl=es&sa=T&oi=gsb&ct=res&cd=1&d=64595)

291

292

293

294

295

296

- 76379904445364&ei=F9tMYvf- 297
- DszBsQL6g4GYBA&scisig=AAGBfm1p06Jl7674LEHg1pKiEGsity6ZYQ 298
- Beer, S. (1979). *The heart of the Enterprise*. Chichester, UK: John Wiley & Sons. 299
- Beer, S. (1993). *Designing freedom*. House of Anansi. 300
- Beer, S. (1993). World in torment: A time whose idea must come. *Kybernetes*, 22(6), 15-43. 301  
doi:<https://doi.org/10.1108/eb005989> 302
- Beer, S. (1994). *Decision and Control: The meaning of operational research and management cybernetics*. London.: 303  
John Wiley & Sons. Retrieved from chrome- 304  
extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fsyscoi.co 305  
m%2Fmodel.report%2Fnkbr.org%2Fdown%2FStafford\_Beer\_Decision\_and\_Control\_The\_Meani 306  
ng\_of\_Operational\_Research\_and\_Management\_Cybernetics\_1995.pdf&chunk=true 307
- Beer, S. (1999). On the nature of models: let us now praise famous men and women, from Warren 308  
McCulloch to Candace Pert. *Informing science*, 2, 69-82. Retrieved from chrome- 309  
extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.inform.nu/Articles/Vol2/v2n3p69- 310  
82.pdf 311
- Bowler, P. J. (1983). *The eclipse of Darwinism: Anti-Darwinian evolution theories in the decades around 1900*. 312  
Baltimore and London: Johns Hopkins University Press. 313
- Campbell, D. T. (1974). Evolutionary Epistemology. In P. A. Schilpp, *The philosophy of Karl Popper* (pp. 413- 314  
463). La Salle: Open Court. 315
- Campbell, D. T. (1997). From Evolutionary Epistemology Via Selection Theory to a Sociology of Scientific 316  
Validity. In E. b. Frankel, *Evolution and Cognition*, 3 (1) (pp. 5-38). 317
- Conant, R. C., & Ashby, W. R. (1970). Every good regulator of a system must be a model of that system. 318  
*International journal of systems science*, 1(2), 89-97. doi:<https://doi.org/10.1080/00207727008920220> 319
- Darwin, C. (1885). *The origin of species by means of natural selection: or, the preservation of favoured races in the 320  
struggle for life*. Devon: J. Murray. 321
- Dutton, D. (2009). *The art instinct: Beauty, pleasure, & human evolution*. USA: Oxford University Press. 322
- Espejo, R. (2000). Self-construction of desirable social systems. *Kybernetes*, 29(7/8), 949-963. 323  
doi:<http://dx.doi.org/10.1108/03684920010342062> 324
- Espejo, R. (2002). Seeing systems: overcoming organisational fragmentation. In *Synergy Matters: Working 325  
with Systems in the 21st Century* (pp. 1-6). Boston, MA: Springer US. doi:[https://doi.org/10.1007/0-306-47467-0\\_1](https://doi.org/10.1007/0-306-47467-0_1) 326  
306-47467-0\_1 327
- Espejo, R. (2004). The footprint of complexity: the embodiment of social systems. *Kybernetes*, Vol. 33 No. 3/4, 328  
671-700. doi:<https://doi.org/10.1108/03684920410523643> 329
- Espinosa, A. (2023). *Sustainable Self-Governance in Businesses and Society, The Viable System Model in Action*. 330  
Abingdon: Routledge. 331
- Espinosa, A., & Harnden, R. (2007). Complexity management, democracy and social consciousness: 332  
Challenges for an evolutionary learning society. *Systemic Practice and Action Research*, 20, 401-412. 333  
doi:<https://doi.org/10.1007/s11213-007-9075-3> 334

- Espinosa, A., Harnden, R., & Walker, J. (2007). Beyond hierarchy: a complexity management perspective. *Kybernetes*, 36((3/4)), 333-347. doi:<https://doi.org/10.1108/03684920710741116>
- Espinosa, A., Harnden, R., & Walker, J. (2008). A complexity approach to sustainability – Stafford Beer revisited. *European Journal of Operational Research*, Vol. 187 No. 2, 636-651. doi:<http://doi.org/10.1016/j.ejor.2007.03.023>
- Holland, J. H. (1992). Complex Adaptive Systems. *Daedalus*, 121(1), 17-30. Retrieved from [https://www.amacad.org/sites/default/files/daedalus/downloads/Daedalus\\_Wi92\\_A-New-Era-in-Computation.pdf#page=37](https://www.amacad.org/sites/default/files/daedalus/downloads/Daedalus_Wi92_A-New-Era-in-Computation.pdf#page=37)
- Jdanko, A. V. (1988). Evolutionary Cybernetic Systems Theory Considered as a Chapter of General Systems Theory – A Viewpoint. *Kybernetes*, 17(5), 44-51. doi:10.1108/eb005802
- Kauffman, S. (1993). *The origins of order: Self-organization and selection in evolution*. New York: Oxford University Press.
- Klir, G. J. (1985). *Architecture of systems problem solving*. Binghamton, NY: Springer Science & Business Media.
- Klir, J., & Valach, M. (1965). *Cybernetic Modelling*. London: ILIFFE books Ltd.
- Lovelock's, J. (1979). *Gaia*. Oxford: Oxford University Press.
- Maturana, H., & Mpodozis, J. (1992). *Origen de las especies por medio de la deriva natural*. Chile: Dirección de bibliotecas archivos y museos. Retrieved from [https://www.mnhn.gob.cl/sites/www.mnhn.gob.cl/files/images/articles-5281\\_archivo\\_01.pdf](https://www.mnhn.gob.cl/sites/www.mnhn.gob.cl/files/images/articles-5281_archivo_01.pdf)
- Osejo-Bucheli. (2024a). Elements of Gilbert Simondon's cybernetic ontology. *SciELOPreprints*, 1-21. doi:<https://doi.org/10.1590/SciELOPreprints.8081>
- Osejo-Bucheli, C. (2022). Theory Evaluation and Formulation: A Reply to Ludic Theory through A.N.Whitehead's Aesthetic Experience. *Philosophy of Management* 21, 415–440. doi:<https://doi.org/10.1007/s40926-022-00194-4>
- Osejo-Bucheli, C. (2023). Adaptation in viable systems is an evolutionary process driven by the system's political identity. *Systems Research and Behavioral Science*. doi:<https://doi.org/10.1002/sres.2993>
- Rawel, J. (2017). The relationship between social and biotic evolution: the evolution of autopoietic systems. *Cybernetics & Human Knowing*, 24(1), 33-53. Retrieved from <https://www.ingentaconnect.com/content/imp/chk/2017/00000024/00000001/art00003>
- Räwel, J. (2020). The origin of species through system differentiation: The evolution of living autopoietic systems. *Kybernetes*, 49(10), 2365-2383. doi:10.1108/K-03-2019-0141
- Reus-Smit, C. (2013). Beyond metatheory? *European Journal of International Relations*, 19(3), 589–608. doi:10.1177/1354066113495479
- Ritzer, G. (1990). Metatheorizing in sociology. *Sociol Forum* 5, 3–15. doi:10.1007/BF01115134
- Rosen, R. (2012). *Anticipatory systems*. New York: Springer.
- Saldaña Rosas, A. J., & Aguilar Contreras, A. I. (2021). Hacia una teoría lúdica de la organización. *Innovar*, 31(79), 123-134. doi:<https://doi.org/10.15446/innovar.v31n79.91900>
- Simondon, G. (2017). *On the mode of existence of technical objects; Translated by Cécile Malaspina and John Rogove*. Minneapolis: Univocal.

- Sklair, L. (1988). Transcending the impasse: Metatheory, theory, and empirical research in the sociology of development and underdevelopment. *World Development* (16) 6, 697-709. doi:10.1016/0305-750X(88)90176-3
- Wallis, S. (2010). Toward a science of metatheory. *Integral Review: A Transdisciplinary and Transcultural Journal for New Thought Research, and Praxis*, 6(3). Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2322985](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2322985)
- Zhao, S. (1991). Metatheory, Metamethod, Meta-Data-Analysis: What, Why, and How? *Sociological Perspectives*, Vol. 34, No. 3, *Recent Explorations in Sociological Metatheorizing* , 377-390. doi:10.2307/1389517

### Declarations

The authors declare that they are fully responsible for the content of this preprint, and acknowledge that its deposit in SciELO Preprints does not imply any commitment from SciELO, beyond its preservation and dissemination. The manuscript has been prepared following ethical norms of scientific communication, and all necessary Terms of Free and Informed Consent from participants or patients involved in the research were obtained and are described in the manuscript where applicable. The authors confirm that the data, applications, and other content underlying the manuscript are properly referenced.

The deposited manuscript is in PDF format. The authors assert that the research adhered to good ethical practices and obtained the necessary approvals from research ethics committees, where required. Once posted on the SciELO Preprints server, the manuscript can only be retracted upon request to the Editorial Secretariat, who will replace it with a retraction notice. The authors agree that the approved manuscript will be available under a Creative Commons CC-BY license.

The submitting author declares that the contributions of all authors and a conflict of interest statement are explicitly included in the manuscript. The authors confirm that the manuscript has not been previously deposited or made available on another preprint server, nor published by a journal. If the manuscript is under review or being prepared for publication by a journal, the authors confirm that authorization has been obtained from the journal for this deposit. Finally, the submitting author declares that all authors agree with the submission to SciELO Preprints.

400

401

402

403

This preprint was submitted under the following conditions:

- The authors declare that they are aware that they are solely responsible for the content of the preprint and that the deposit in SciELO Preprints does not mean any commitment on the part of SciELO, except its preservation and dissemination.
- The authors declare that the necessary Terms of Free and Informed Consent of participants or patients in the research were obtained and are described in the manuscript, when applicable.
- The authors declare that the preparation of the manuscript followed the ethical norms of scientific communication.
- The authors declare that the data, applications, and other content underlying the manuscript are referenced.
- The deposited manuscript is in PDF format.
- The authors declare that the research that originated the manuscript followed good ethical practices and that the necessary approvals from research ethics committees, when applicable, are described in the manuscript.
- The authors declare that once a manuscript is posted on the SciELO Preprints server, it can only be taken down on request to the SciELO Preprints server Editorial Secretariat, who will post a retraction notice in its place.
- The authors agree that the approved manuscript will be made available under a [Creative Commons CC-BY](#) license.
- The submitting author declares that the contributions of all authors and conflict of interest statement are included explicitly and in specific sections of the manuscript.
- The authors declare that the manuscript was not deposited and/or previously made available on another preprint server or published by a journal.
- If the manuscript is being reviewed or being prepared for publishing but not yet published by a journal, the authors declare that they have received authorization from the journal to make this deposit.
- The submitting author declares that all authors of the manuscript agree with the submission to SciELO Preprints.