

Life-as-it-could-be, Symbiosis in Interspecifics' Codex Virtualis_Genesis

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Abstract

This paper discusses *Codex Virtualis_Genesis* (2020-2022) as an artistic engagement of Artificial Life (AL) that explores the nature of informational life as a symbiotic process. Created by Mexico City-based transnational collective Interspecifics (INT), this work follows on from the expanded notions of life central to the field of artificial life, including organic, inorganic, material, and virtual forms. According to its founder, Christopher Langton, "there is nothing... that restricts biology to carbon-based life; it is simply the only kind of life that has been available to study." From this perspective, Langton proposed in the late 1990s that AL be dedicated, as he put it, to speculating beyond "life-as-we-know-it" into the realm of "life-as-it-could-be." This discussion examines *Codex Virtualis_Genesis* in light of Langton's proposal as a speculative inquiry into a symbiotic view of life, and as well in contrast to notions of artificial life art as a predominantly technophilic practice. Instead connected to the speculative imagination, the synthetic life forms of *Codex Virtualis_Genesis* offer a glimpse into life otherwise: as an interspecific relation.

Keywords

Artificial Life, Artificial Life Art, Mexico, Symbiosis, Symbiocene.

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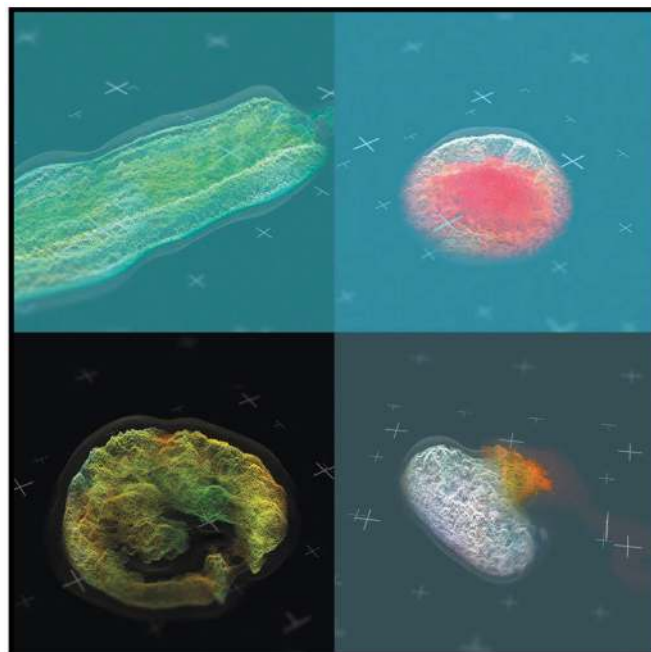
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Codex Virtualis_Genesis

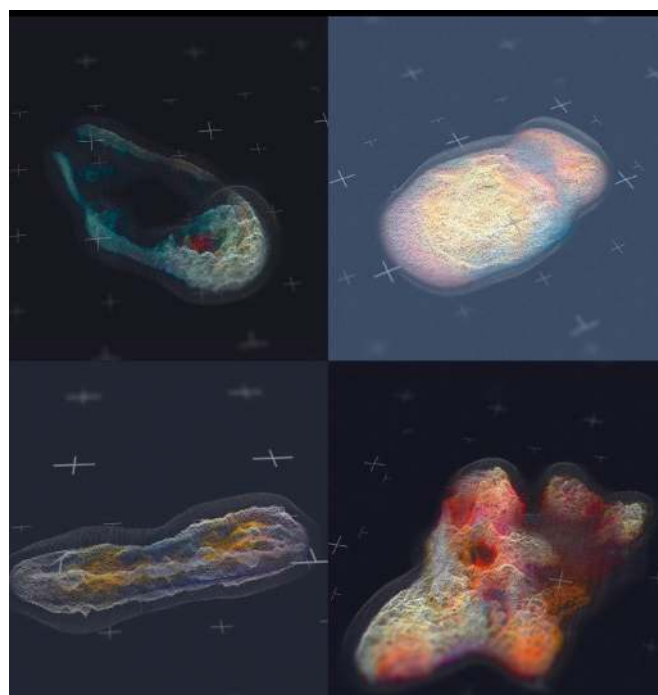
Interspecifics' *Codex Virtualis_Genesis* (2021-2022) was created for the SETI x AI Lab residency, an art and science program started in 2018 by the Ars Electronica Futurelab in Linz, Austria in collaboration with the AI Lab (European ARTificial Intelligence Lab) and the SETI Institute in Mountain View, CA.¹ The program calls on international artists working in digital art to create works "that explore the evolution of life on earth and universe and critically reflect on anthropocentric world views."²

Interspecifics won the 2021 Ars' AI Lab residency call with their proposal to create *Codex Virtualis_Genesis* as an evolving taxonomic collection of hybrid AL forms.³ In practice, to create these forms' shape, color, texture, morphological structures and behavioral dynamics, Interspecifics used a 2D cellular automata system (a planar cell-based computer graphic system that displays emergent global behaviors), and two sets of images of living symbiotic organisms. One set is microscope images (microscopy) of microorganisms living in water bodies that were posted by various scientists on their Instagram accounts.⁴ Another set was digital photographs of colonies of fungi and bacteria (8,000 distinct species) made available online by researchers at the National Agriculture and Food Research Organization, NARO, in Japan. Some of the latter organisms are also known as extremophiles because they are metabolically and biochemically adaptable to harsh environmental conditions such as broad swaths of temperature, pH, pressure, radiation, salinity, energy, and nutrient limitation. They have therefore been historically used in astrobiology experiments, including most recently conducted at the ISS (International Space Station).⁽¹⁾

The resulting images resemble plant and animal-like microorganisms in a wide range of colors and shapes (Figure 1a and 1b). In a gallery setting, *Codex Virtualis_Genesis* is shown as a screen-based installation that as well as displaying selected images of said organisms, also displays images of aspects of the selection process and evolutionary procedures (Figure 2).



1a and 1b. Symbionts generated for *Codex Virtualis_Genesis*, Ars Electronica 2021. Courtesy of Interspecifics.



1b. Symbionts generated for *Codex Virtualis_Genesis*, Ars Electronica 2021. Courtesy of Interspecifics.



2. *Codex Virtualis_Genesis*, Ars Electronica 2021. Photo credit: Robert Bauernhansl.

Additionally, in the printed materials provided to visitors at exhibitions, Interspecifics describes *Codex Virtualis_Genesis* as titled in a loose nod to Mesoamerican codices and based on “the symbiotic narrative of evolution.”⁵ Specifically this refers to endosymbiosis, a process of symbiotic life evolution proposed by the biologist Lynn Margulis in the late 1960s. Endosymbiosis foregrounds symbiotic mergers (pre-nucleic gene transfer between bacteria and other organisms) as the main sources of acquisition of new genomes and thus also of speciation (i.e., the formation of new and distinct species in the course of evolution). From this perspective, random mutation is of marginal consequence as the driver of evolution and so consequently Margulis argued that Darwinian evolutionary theory based solely on competition (i.e., the survival of the fittest) is incomplete. According to Margulis, “Life did not take over the globe by combat, but by networking. Life forms multiplied and complexified by co-opting others, not just by killing them.”⁶

Interspecifics’ *Codex Virtualis_Genesis* brings Langton and Margulis in dialogue with an eye to complement their respective perspectives on the nature of life. In this interest, it extends Margulis’ restricted notion of life (as carbon-based) to as well, as proposed by Langton, include synthetic forms. Conversely, by linking AL and symbiosis it also clarifies Langton’s speculative vision of AL (i.e., as “life-as-it-could-be”).⁽²⁾ According to a member of Interspecifics, Leslie Garcia, this dialogue speaks to the project’s overarching concept: namely to simultaneously call attention to our “entanglements” and to stimulate speculative imagings and imaginaries of “non-anthropocentric and non-anthropomorphic but more organicist, metabolic models of life.”⁷

Cooperate!

Codex Virtualis_Genesis not only demonstrates life as a mutualistic relation on screen but is itself created with an eye for developing art and science as mutualistic practices: in Interspecifics’ own words, “to produce in terms of social inclusion, cross-disciplinary practices, and open knowledge.”⁸ To this concern, the project contributes to broadening access to artificial life techniques and consonantly increasing diversity in artificial life art as an area of the global digital arts. As aforementioned, Interspecifics drew on freely available images shared by scientists and scientific communities online and social media to create *Codex Virtualis_Genesis*’ symbiotic organisms. Additionally, Lenia, a readily available system of cellular automata or artificial life, is integral to the project. Created by the Chinese software engineer Bert Wang-Chak Chan in 2015, this system is a variation on The Game of Life (GoL) devised by the British mathematician John Horton Conway in 1970, which was originally played on a simple square grid without the aid of computers. GoL is a class of mathematical phenomena termed cellular automata by John von Neumann in his discussion of self-reproducing machines in the mid-1940s.⁽³⁾ Both GoL and Lenia are AL systems that focus on life not as a material substrate but as a form of organization and behavior that is akin to the distributed processes characteristic of the functioning of living organisms. Alternatively, these systems can also be conceived as no-player games; meaning that after the initial configuration their evolution does not require further input. The point of cellular automata like GoL and Lenia is in short to demonstrate the emergence of the variety and complexity of behaviors from a few simple rules. These systems differ insofar the sophistication of their graphics. In comparison to GoL’s square graphics, which now look outdated, Lenia’s fuzzy, smooth, and colorful patterns look state of the art. More significantly for artists broadly, as art funding becomes ever more restricted, and in particular artists that as Interspecifics puts it, work via-á-vis the context of “precarity” in the global South, Lenia is as an open-source art and science project. Still requiring some technological expertise, it nevertheless is in theory accessible to a global public.

Already, in an updated version of his 1989 article on Artificial Life, Langton speculated that the future evolution of AL would depend on scientists’ imitating nature’s cooperative behaviors (so he urged biologists and computer technicians to follow its example).⁽⁴⁾ Artificial life art, as A-life artist Simon Penny notes, is

similarly an area of digital arts with a high degree of interdisciplinarians and/or collaborative partnerships between artists and technicians because artificial life techniques are technically demanding.⁽⁵⁾ Because of the emphasis on technical expertise and state-of-the-art technology in the field (what Penny calls “high nerd quotient” and the art historian María Fernández calls digital art’s “aesthetic technofetishism”), artificial life art has been dominated by artists working in the global North.⁽⁵⁾⁽⁶⁾⁹ Artists like Interspecifics are at the forefront of developing artificial life art as an emerging area of the digital arts in Mexico along with a new generation of artists in Latin America, including the Argentinian artists Leo Nuñez and Sofia Crespo and the Peruvian artist Paola Torres Nuñez del Prado. Projects like Linea are significant because they broaden access to AL, both beyond the sciences and the global North.¹⁰ It is to this concern that Interspecifics, just as with all their projects, additionally made some of the research, techniques, and coding created for *Codex Virtualis_Genesis* freely available online.¹¹

Codex Virtualis

Codex Virtualis_Genesis is yet but the first of the four parts of the total project proposed by Interspecifics under the title *Codex Virtualis*. The collective is currently developing the second part of this project, which is entitled *Habitat* involves testing the extremophile capabilities of the organisms created in *Genesis* by exposing them to inputs that simulate the harsh conditions of extraterrestrial environments. A third part, which is titled *Emergence* proposes testing the possibility of intra-actions (transfers) between artificial and biological organisms. Lastly, *Codex Virtualis: Life* involves testing the resilience of resulting hybrid organisms and accordingly selecting one organism to live virtually in *Codex Virtualis*.¹²

As a contemporary artificial life artwork, *Codex Virtualis* follows on a longstanding quest for mimesis or life-likeness that spans the histories of art, science, and technology, and as well includes social, spiritual, commercial, intellectual, and military histories. Langton himself traced the origins of AL to this pursuit in the history of art, starting with paintings and “statuettes” that “capture the static forms of living things.” He goes on to discuss hydraulic technology such as Egyptian water clocks or clepsydra as the next step towards imitating nature’s dynamic behavior. This trajectory developed with the invention of the mechanical escapement in AD 850, ushering in the age of clockwork technology. Refined throughout the European Middle

Ages and the Renaissance, eventually, clockwork regulation of mechanical devices would not only be used to power them but also to sequence their motions or behaviors.¹³

Langton refers to this development as technology of process-control, which in the first instance involved interchangeable cams or drums with movable pegs. A variety of programmable automata are examples, including lifelike mechanical figures and animals such as the writing and picture-drawing automata built by the Jaquet-Droz family in Switzerland in the 18th century. In the early part of the twentieth century, during WWII and the Cold War, as Langton explains, physical programmable controllers gave way to abstract control structures, or sets of rules or programs. In effect, as he puts it, this is the moment when the “‘logical form’ of the machine was separated from its material basis of construction.” Today’s computers are a technology of process-control and in this sense the equivalent to an “algorithm: the logic underlying the dynamics of an automaton.”⁽⁷⁾¹⁴

Artificial life art, which in the contemporary context is facilitated by computer technology, is consequently heir to these legacies.⁽⁸⁾ According to Penny, artificial life art in digital environments spans three decades, beginning in the late 1980s, as artists turned to “a new type of interactivity” in search of a “new order of mimesis in which ‘nature’ as a generative system, not as an appearance, is being represented”.⁽⁵⁾ To put it otherwise, artists became interested in artificial life in pursuit of developing art contrary to ingrained notions of artistic practice. That is, to create art not as an object but as a process, and in extension, to explore the role of the artist not as one about control over materials, but as an initiator of an open-ended process. This initial focus on unpredictability and novelty has since, however, been debated as an illusory pursuit, given that, as Penny adds, “the mechanism of simulated evolution” appear in comparison to the limitations of biological evolution more restricted; that is, as bound to the “conditions... established by logic-theoretic enframing” of mathematical models.⁽⁵⁾

Yet, while *Codex Virtualis_Genesis* and its larger project, *Codex Virtualis* shares interest in interactive aesthetics, this is not the project’s main focus. Its focus is rather apropos of the curator and cultural critic Edwina Bartlem’s noting as part of her recent discussion of artificial life art that “A-life discourse contains a prophecy of futuristic and imaginary posthuman or post-organic life.”⁽⁹⁾ *Codex Virtualis* speaks above all to this imaginary, as according to Interspecifics, “‘*Codex Virtualis*’ imagines ways of living together, of deep

interspecific relations that may enhance our possibilities of survival.”¹⁵ Garcia further clarified the project’s concept on another occasion, as a proposal to imagine life and a new world beyond the Anthropocene, consonant to “the Symbiocene.”¹⁶

Garcia’s reference is to a term coined by the eco-anarchist philosopher, Glenn Albrecht, the Symbiocene. Symbiocene refutes the fatalistic implications of the Anthropocene, and, as largely inspired by Margulis’ notion of endosymbiosis affirms the possibility of creating a more sustainable world based on non-anthropocentric mutualism. ⁽¹⁰⁾ In this light then *Codex Virtualis* engages symbiosis as a metaphor and as a form of dialogue, debate, and exchange (i.e., between art, science, and politics) for conceptualizing life in a sustainable posthuman age. Because of its ecological focus, it as well in extension broadens the existing e imaginaries and themes engaged in artificial life art.

Notes

1 Interspecifics was founded in Mexico City in 2013. Core members are Leslie García, Paloma López Ramírez, Emmanuel Anguiano Hernández, Felipe Rebolledo Carvajal, Carels Tardío Pi, and Maro Pebo.

2 Ars Electronica is a cultural institute devoted to media art founded in Linz, Austria, in 1979. A leading organization in the global media arts, as well as managing a museum, multidisciplinary art research facilities, and an annual festival, it confers the most prestigious award in the genre, the Prix Ars Electronica. Founded in 1984, the SETI Institute stands for the “search for extraterrestrial intelligence.” It is a non-profit dedicated to the study of life and intelligence in the universe through multidisciplinary research, education, and partnerships with industry, academia and government agencies, including NASA and NSF.

3 Available at, https://int-lab.cc/codex/?page_id=2.

4 According to Interspecifics, the initial idea was for collaborating (SETI) scientists to share their images with the group for the project. As it happened, the scientists failed to provide these images in the end. Leslie Garcia, “Interspecifics, *Codex Virtualis: Genesis*,” lecture, “Neurotalk ‘Máquinas y seres vivos: Comunicaciones desde el arte’,” Programa ACT (Arte, Ciencia y Tech- nologías), UNAM, March 2, 2022, available at, https://www.youtube.com/watch?v=NFE_F6HzakY.

5 Interspecifics, *Codex Virtualis_Genesis*, exhibition booklet, 2021, 4, available at, https://int-lab.cc/codex/?page_id=183.

6 Lynn Margulis and Dorion Sagan, *Microcosmos: Four Billion Years of Microbial Evolution* (Berkeley, CA: University of California Press, 1997), 29. Margulis’ speculations have been corroborated in the last decade as for example by scientists discovering that in ecosystems across the world, there are immense, mutually beneficial associations of macrofungi with flowering plants in complex, positive, metabolic, symbiotic relationship to each other. Findings such as these have scientifically overturned the view that evolution and life are solely founded on competitive struggle between species.

7 Leslie Garcia, “Interspecifics, *Codex Virtualis: Genesis*,” lecture, “Neurotalk ‘Máquinas y seres vivos: Comunicaciones desde el arte.” It is worth to note here that Margulis’ notion of endosymbiosis implies a critique of heterosexist articulations of life, (i.e., the singularly privileged place of heterosexual reproduction in evolutionary biology), which presently resonates with Karen Barad’s notion of “nature’s queer performativity”, which likewise denotes multispecies co-involvements as the drivers of life’s heterogeneity. See, Karen Barad, “Nature’s Queer Performativity” in *Kvinder, Køn og forskning / Women, Gender and Research* nos. 1-2 (2012): 25-53.

8 See, <http://interspecifics.cc/>.

9 Artists working with digital A-life systems mostly reside in North America, Europe, and Australia, and include Karl Sims, Tom Ray, William Latham, Ken Rinaldo, Bill Vorn, Louise-Philippe Demers, Troy Innocent, Jon McCormack, Robb Lovell and John Mitchell, Christa Sommerer and Laurent Mignonneau, Jane Prophet and Gordon Selley, Paul Brown, Richard Brown and Mauro Annunzianto. See also, Fernández, “‘Life-like’: Historicizing Process and Responsiveness in Digital Art”; Sarah Kember, *Cyberfeminism and Artificial Life* (London and New York: Routledge, 2003); “; Michael Whitelaw, *Metacreation: Art and Artificial Life* (Cambridge, MA: MIT Press, 2004); and Simon Penny, “Twenty Years of Artificial Life Art”, in *Digital Creativity* 21, no. 3, Dec. 2010: 197-204.

10 To date, along with scientists, game designers, filmmakers and artists across the world, including among them, Interspecifics, have used Lenia to develop their respective projects and in the process added to the evolving diversity and complexity of behaviours of its life forms. According to Chan, to date, more than 400 species in 18 families have been identified in Lenia. B. W.-C. Chan, “Lenia: Biology of Artificial Life,” *Complex Systems*, 28(3), 2019, pp. 251-286. See also, Siobhan Roberts, “The Lasting Lessons of John Conway’s Game of Life”, in *The New York Times*, Dec. 28, 2020, available at, <https://www.nytimes.com/2020/12/28/science/math-conway-game-of-life.html>.

11 See, <https://int-lab.cc/codex/>.

12 The duration, location, and conditions of this last stage are yet to be clearly specified as at the time of writing, Interspecifics is still developing the second stage in the project, *Habitat*.

13 The Muslim inventor Ismail al-Jazari’s *The Book of Knowledge of Ingenious Mechanical Devices* (1206) is currently considered by historians of science to be a significant groundwork for modern engineering, hydraulics, and even robotics. *The Book* builds on science and wisdom from ancient Greek, Indian, Persian, Chinese and other cultures and offers a how-to manual of sorts that includes alongside richly detailed illustrations as well as instructions on how to build al-Jazari’s inventions spanning playful robots to practical contraptions.

14 Likewise, the Latine artist Micha Cárdenas has traced algorithmic culture to pre-digital technology, citing recipes and rituals as examples. Additionally, Cárdenas reminds us that the word algorithm is a derivation of the name of the scholar Muhammad ibn Musa al-Khwarizmi (780-850 A.D.), credited with inventing algebra in his book *Dixit Algorismus*. Micha Cárdenas, *Poetic Operations, Trans of Color Art in Digital Media* (Durham, Duke University Press, 2022), 7.

15 Interspecifics, *Codex Virtualis_Genesis*, exhibition booklet.

16 Garcia, “Interspecifics, *Codex Virtualis: Genesis*,” lecture “Neurotalk ‘Máquinas y seres vivos: Comunicaciones desde el arte”

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(7) Langton, "Artificial Life," 41-46.

(8) María Fernández See, "'Life-like': Historicizing Process and Responsiveness in Digital Art," in *A Companion to Contemporary Art since 1945*, edited by Amelia Jones, Malden, MA, Blackwell Publishing, 2006, 557-581.

(9) Edwina Bartlem, "Immersive Artificial Life (A-Life) Art," in *Backburning: Journal of Australian Studies* 84, edited by Helen Addison-Smith, An Nguyen and Denise Tallis, Perth, API Network, 2005.

(10) See, Glenn Albrecht, *Earth Emotions: New Words for a New World*, Ithaca, NY, Cornell University Press, 2019.

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