

Artificial Life Comparative Landscape

Cosmogonic Quantum Mechalogodrom

A corrected comparison of 150 external entries, with a separate evidence-based profile of Mechalogodrom. The landscape includes artificial-life systems, methods, toolkits, creative software, biological models and adjacent AI research.

150	25	130
Distinct comparison entries	New entries added	Repeated PDF rows removed

What this edition establishes

The supplied PDF contains 140 numbered rows but only 10 unique names, each repeated 14 times. Its ecology column repeats the same execution-model label throughout. The pasted CSV is substantially richer: it exactly matches the repository's 129-row comparison after parsing, including Mechalogodrom.

The corrected catalog has 132 entries reviewed against primary-source content and 18 with explicitly partial source review. These labels cover identity and conservative descriptions; they do not mean all papers, code, historical claims or benchmark results were independently reproduced.

Assessment: Mechalogodrom has a defensible case as a broad experimental integration platform. The reviewed evidence does not establish overall superiority, sustained open-ended evolution, consciousness, or physical quantum-computing advantage.

Read in order: corrections and method → Mechalogodrom assessment → closest comparisons → expanded catalog → repository evidence and follow-up tracker.

01 What was corrected

PDF repetition. 140 numbered rows collapse to 10 names. Remove 130 repeated rows; preserve the nine identifiable names in the source-reviewed catalog. The PDF-only Evosphere label lacks an unambiguous citation and remains outside the counted catalog.

Incorrect ecology field. “Deterministic Execution Model” describes neither a food web nor resource competition. Execution determinism and ecological dynamics are independent properties.

False project total. Original CSV: 129 rows = CQM + 128 external entries. No exact duplicate project names occur in the CSV; its overlap problem is conceptual, not literal repetition.

Double count / scope. Merge UNIMAL into DERL. Put generic quality-diversity in the glossary. Put 3DVCE in the unresolved queue because its detailed primary evidence was not recovered.

Wrong citations. Core War was linked to the 2026 Digital Red Queen paper. Krčah’s creature-evolution entry linked to another author’s thesis. Artificial Anasazi used the wrong DOI. All have corrected references.

Wrong or oversimplified claims. Correct SimAnt’s subtitle; distinguish Clusters from Particle Life; acknowledge MASON’s physics2d extension and Sodarace Kiosk’s evolutionary mechanism.

Unsupported rankings. Remove uncalibrated 0–5 scores and decimal “confidence” from the main comparison. Preserve them verbatim in the workbook’s Legacy scores sheet for traceability.

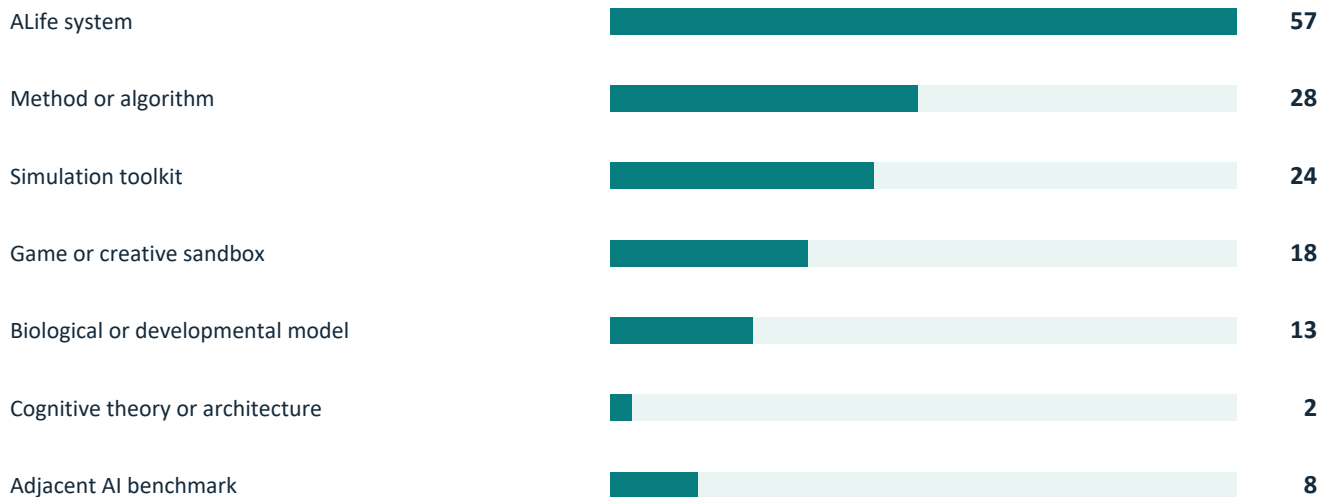
Repository drift. Current nine-axis CQM mean is 3.8, while README retains 3.84. The open-endedness dashboard and refuge-ablation prose also contain stale descriptions. See the final evidence appendix.

Transparent count reconciliation

Step	External entries
Original CSV, excluding CQM	128
Merge UNIMAL into DERL	–1
Move generic quality-diversity to glossary	–1
Move unresolved 3DVCE to review queue	–1
Add separately sourced entries	+25
Corrected main catalog	150

02 How to read the comparison

This is an evidence-audited landscape, not a league table. A cellular automaton, a neural-agent ecology, an evolutionary optimizer, a simulation library and a theory of consciousness answer different questions. Category is part of every record so an abstract theory is not penalized for lacking graphics and a toolkit is not credited with behaviors that a user has not implemented.



Evidence labels

Primary-source reviewed: an original paper or abstract, creator documentation, original manual, or maintainer description supports the short factual summary. This does not certify every assertion in the original pasted basis text, full-text experimental quality, or present-day executability.

Partial-source reviewed: only limited primary text, bibliographic metadata, historical material or incomplete source access was available. The review note identifies the limit. Unsupported quantitative and superlative claims are not carried into the new description.

Unresolved: evidence is insufficient for a responsible counted entry. Such records remain visible in the workbook's Dispositions sheet. A website being inaccessible is an access limitation, not proof a project is fictitious or defunct.

Deduplication policy

One row represents one named research artifact, system, method or explicit family entry. UNIMAL is merged because it is the design space in the DERL study. Avida-ED, OpenELM, EvoSoro and Sensorimotor Lenia remain distinct tools or research extensions with related-family labels. Related families are navigation aids, not a count of independent inventions. Combined SDSR/Evoloop and Constructor/Sodarace rows each count once and name their differences.

Historical versions and publication descriptions are scoped to their sources. Original era values remain in Legacy scores, but are not republished as verified inception dates. A paper's submission year, a software release year and a project's origin year are different facts.

03 Why the old mathematics misleads

The repository’s breadth measure averages nine author-assigned ratings. Its current CQM vector is [4.0, 2.0, 3.4, 3.8, 4.5, 4.6, 4.4, 3.5, 4.0]. Their sum is 34.2 and $34.2 / 9 = 3.8$. Peer maturity is reported separately, rather than included in this breadth average.

That arithmetic is reproducible. Its interpretation as scientific superiority is not justified: the ratings are subjective and approximately ordinal, the axes overlap, missing capabilities are mixed with out-of-scope capabilities, and the comparison population was chosen by the project. A decimal does not create measurement precision.

A z-score here describes distance from this hand-selected score table’s mean in its own standard-deviation units. It is not a p-value, a probability that CQM is better, or a confidence interval. PCA, distances and Pareto-front membership inherit the same scoring and selection assumptions.

Sensitivity check on the original 129 rows

Axes retained	CQM mean	Position in original rubric
All nine axes	3.8000	1
Omit substrate pluralism	3.7000	1
Omit consciousness theory	3.8375	2
Omit substrate pluralism, consciousness theory	3.7286	4

This is a diagnostic of rubric sensitivity using unchanged input ratings, before this audit’s exclusions and additions. It is not a replacement ranking. Removing consciousness-theory alone changes CQM from first to second; removing that axis and substrate-pluralism changes it to fourth.

A better measurement model

Use separate, task-specific outcomes with definitions, units and uncertainty: inherited offspring fidelity; mutation and selection effects; lineage survival; novelty persistence; species and trophic diversity; control performance after ablation; wall time, memory and hardware. Record “not applicable” separately from “not documented” and “tested absent.”

Rename substrate pluralism to coupled-model diversity when discussing classical software. Multiple differential equations, controllers and statevectors are multiple modeled formalisms on digital hardware, not evidence of multiple physical computational substrates. Treat consciousness-theory engagement as an architectural research topic, never a consciousness quantity.

04 Mechalogodrom: supported scope

The current working files describe a browser-hosted artificial-life and cognitive-mechanism testbed. Static inspection supports several concrete implementations, including inherited traits, bounded mutation, gene-linked fission and classical quantum-model calculations. Its most defensible distinction is the integration of diverse mechanisms with visible interaction and experimental instrumentation.

Reproduction

Asexual trait inheritance, bounded point mutation and gene-linked fission probability in the live base population.

Boundary: Simulated organism copying and fecundity selection; not instruction-level self-replication, autonomous genome construction or demonstrated open-ended evolution.

Open-endedness

Fission probability rises monotonically with inherited nW ; the canonical script identifies the fixed optimum at $nW=1$.

Boundary: Bounded adaptation toward an authored objective. Sustained adaptive innovation and increasing organizational complexity remain unestablished.

Ecology

Documented grazing, waste/fertilizer feedback, predation and sanctuary protection; refuge tests isolate the predation-immunity mechanism.

Boundary: Authored ecological feedback, not independently validated ecological fidelity or demonstrated long-term plant-genome coevolution. Test source inspected; outcomes not rerun.

Morphology and visual scale

Reaction-diffusion patterns, state-driven morphing geometry and pooled rendering; documentation distinguishes 10k default scale from a 50k stress ceiling.

Boundary: Reactive morphing differs from evolved articulated body plans. Population count does not establish equivalent physics fidelity or smooth performance across systems.

Cognition and learning

Bounded neural policies, prediction-error control, chemotaxis, numerical drive resolution and metacognition modules have focused intervention tests.

Boundary: These mechanisms do not define a calibrated intelligence score. Retained V4 and Phase-B failures restrict broader learning, adaptation and general-intelligence claims.

Mechalogodrom: evidence boundaries

Model integration

Classical statevector calculations, numerical wave dynamics, neural controllers and ecological rules supply interacting control signals.

Boundary: Multiple numerical model families share classical hardware. They establish neither physical substrate diversity nor QPU operation, quantum speedup or quantum consciousness.

Instrumentation and replay

Seeded RNG diagnostics, ablation hooks, test artifacts and input replay provide observability and reproducibility tools.

Boundary: Tests and statistical randomness checks do not certify scientific validity, cryptographic randomness or physical entropy. Live entropy requires recorded inputs for exact replay.

Consciousness research

Kernel outputs explicitly carry indicatorOnly; canonical documents record a project assessment of eight Butlin indicators met and six partial.

Boundary: An architectural interpretation, not external certification or evidence of subjective experience. Reported null-control and coupling limitations remain material.

Scientific maturity

The repository publishes source, focused tests, retained negative results and a nine-axis comparison based on documentation judgments.

Boundary: Independent replication and matched competitive benchmarks are not established. The 3.8 mean and rank depend on a subjective rubric and selected comparison set.

Xylos note

A separate recurrent numeric organism senses chemistry, adapts coupling and acts autonomously, with visible neural state and bounded local input recording.

Boundary: Apex indicator results do not transfer to Xylos. Replay reconstructs its input-driven brain trajectory, not the shared world; consciousness and open-ended evolution remain unestablished.

Current negative results matter

The repository retains failed V4 and Phase-B controls and narrows positive Titan results to bounded game-policy causality. These results must remain beside positive mechanism descriptions; counting modules or successful tests cannot justify a broad intelligence, adaptation or consciousness claim. Experimental outcomes are repository reports and were not rerun here.

Xylos belongs in the updated profile

Current Xylos documentation describes recurrent numerical sensing and action, plastic coupling, visible neural state, seeded operation and optional browser-entropy input. Its replay reconstructs local brain-input trajectories, not an entire world rollback. This is a meaningful subsystem update within CQM, rather than an extra external competitor or proof of sentience.

05 Compare like with like

These are proposed comparison sets, selected by mechanism overlap rather than a single aggregate score. Catalog entries provide source links; the CQM evidence appendix identifies the corresponding local implementation and limitations.

Hereditary digital evolution

Avida; Tierra; Stringmol; DISHTINY

Compare mutation fidelity, differential reproduction and lineage dynamics. CQM's trait-linked fission is not equivalent to copying an executable genome.

Embodied neural ecologies

Polyworld; Creatures; The Bibites; DarwinBots

Compare food acquisition, energy costs, inherited policies, lifetime learning and ecological persistence under matched disturbances.

Development plus ecology

Biomaker CA; Flow Lenia; JaxLife

Compare resource-driven survival, inherited developmental change and behavior across generations; define what counts as a new adaptive function.

Evolving bodies and control

Sims; Framsticks; DERL/UNIMAL; EvoSoro

Compare heritable body topology and physical task performance. Shader changes and reactive geometry do not establish evolved body plans.

Pattern agency and regeneration

Lenia; Sensorimotor Lenia; Growing NCA; Neural Particle Automata

Compare perturbation recovery, persistence and control. Pattern formation, training and hereditary evolution are separate mechanisms.

Coupled biological simulation

PhysiCell; CompuCell3D; Morpheus; Tissue Forge

Compare model coupling, numerical validation and biological observables. Breadth of coupled software models is not unique to CQM.

Open-ended search

Enhanced POET; OMNI-EPIC; Novelty Search; Digital Red Queen

Compare persistent novelty and transfer across a changing environment. Discovery under a fixed reward or finite archive is not unbounded evolution.

Theory-driven cognitive architecture

LIDA; Conscious Turing Machine

Compare explicit architectural commitments and falsifiable mechanisms. Theoretical coverage and indicator gates do not measure subjective experience.

06 What would strengthen the claims

The following is a proposed validation program, not a claim that these experiments were run during this document audit. It turns the original score axes into reviewable research questions.

Reproduction and selection. Compare trait-linked fission against trait-blind fission and mutation-disabled controls, keeping resources and event streams matched. Track parentage, offspring traits, population size and selection response across independent seeds.

Open-endedness. Predefine novelty measures and adaptive challenges. Track innovation discovery and persistence over increasing run lengths and compute budgets, alongside stagnation baselines. Do not claim infinity from a finite run.

Ecological causality. Ablate refuge immunity, resource renewal and waste recycling separately. Measure persistence, diversity, interaction networks and energy accounting; report extinction cases as well as successful runs.

Cognition and learning. Separate inherited controller structure, online parameter updates and human-authored heuristics. Use held-out perturbations, matched controls, action ablation and transfer tasks; preserve currently failed controls.

Physics and numerical models. Check conservation and discretization behavior against analytic or trusted numerical references. Report time step, grid resolution, precision and model-coupling assumptions.

Reproducibility and scale. Pin code, configuration and hardware; save random seeds plus external entropy inputs. Measure throughput and memory under equivalent tasks. Publish raw measurements, analysis code and failed cases.

Independent evidence. Provide a minimal reproducible benchmark bundle and invite independent replication. A large internal test suite establishes software checks, not scientific construct validity or external acceptance.

Consciousness indicators should be reported with their theory-specific assumptions and uncertainty. The underlying research framework discusses computational indicator properties; it does not make an internal checklist a proof of experience. [Butlin et al., 2023](#).

07 Expanded source-linked catalog

150 entries follow, grouped by purpose. Every entry has a stable catalog ID, a conservative description, an evidence label and a source link. “Review note” states a correction or interpretation boundary. The full verification note, original row mapping and old scores are available in the workbook and searchable HTML.

The 25 additions strengthen coverage of artificial chemistry, multicellularity, developmental ecology, learned morphogenesis, scientific simulation and evolutionary tools. They include JohnnyVon, GARD, DISHTINY, Biomaker CA, JaxLife, Sensorimotor Lenia and Neural Particle Automata, alongside clearly labeled tools such as Morpheus, SLiM and ARGoS.

ALife system

57 entries · descriptions checked to the extent indicated

C001 Aevol

primary source reviewed · Supplied CSV

Digital organisms with genome architecture evolve through mutation, reproduction, competition, and environmental selection.

Review note: A fixed-target characterization is too broad: platform supports controlled environmental variation and extensions.

<https://www.aevol.fr/>

C002 AlChemY

primary source reviewed · Supplied CSV

Artificial chemistry applies lambda expressions to one another, producing computational reaction networks and self-organized organizations.

Review note: Cited paper revisits 1990s work; label source as a replication rather than the original 1994 publication. Robustness is qualified by observed fragility.

<https://arxiv.org/abs/2408.12137>

C003 ALIEN

primary source reviewed · Supplied CSV

CUDA simulation and rendering combine soft-body and fluid dynamics, genomes, neural networks, and ecosystem tools.

Review note: Current feature documentation supports mechanisms, not sustained open-ended evolution, consciousness, or claimed superiority scores.

<https://www.alien-project.org/index.html>

C004 Amoeba

primary source reviewed · Supplied CSV

Random machine-instruction sequences can self-organize into self-replicating programs in a computationally universal instruction environment.

Review note: Use the verified paper record; emergence of replication is distinct from unlimited evolutionary innovation.

<https://pubmed.ncbi.nlm.nih.gov/11461689/>

C005 Autopoietic tessellation (Varela–Maturana–Uribe)

partial source reviewed · Supplied CSV

Early computational model represents component production and boundary maintenance in a spatial particle system.

Review note: Input URL is McMullin's review, not the original paper. Self-maintenance does not imply offspring production; primary details require further review.

<https://pubmed.ncbi.nlm.nih.gov/15245628/>

C006 Avida

primary source reviewed · Supplied CSV

Self-replicating digital organisms evolve through mutation, selection, and drift in controlled computational experiments.

Review note: Capabilities vary by experiment; instrumented digital evolution is not an unconditional proof of open-endedness.

<https://github.com/devosoft/avida>

C007 Biogenesis

primary source reviewed · Added in this audit

Colored segment-based organisms mutate and evolve in a two-dimensional simulation inspired by Primordial Life.

Review note: Compare inherited morphology and ecological interactions; do not infer cognition from evolving shapes.

<https://sourceforge.net/projects/biogenesis/>

C008 Biomaker CA

primary source reviewed · Added in this audit

Plant-like cellular-automaton organisms grow from seeds, compete for nutrients and reproduce with variation in simulated biomes.

Review note: A close comparator for coupled development, resource flows and reproduction; stability depends on configuration.

<https://arxiv.org/abs/2307.09320>

C009 biosim4

primary source reviewed · Supplied CSV

Genomes specify neural controllers for agents in a two-dimensional grid, with configurable generational selection and signals.

Review note: Evolved neural wiring is not evidence of lifetime synaptic learning; claims depend on configured selection scenario.

<https://github.com/davidrmiller/biosim4>

C010 Boids

primary source reviewed · Supplied CSV

Local separation, alignment, and cohesion rules generate coordinated flocking; additional steering behaviors support obstacle avoidance.

Review note: Collective motion is not by itself a food web, reproduction mechanism, or learned policy.

<https://www.red3d.com/cwr/boids/>

C011 Chemlambda

primary source reviewed · Supplied CSV

Local graph-rewrite systems exhibit persistent, multiplying and terminating structures in experiments inspired by artificial chemistry and lambda calculus.

Review note: Computational graph replication does not by itself establish Darwinian ecology or biological metabolism.

<https://arxiv.org/abs/2003.14332>

C012 Chromaria

primary source reviewed · Supplied CSV

Artificial-life world supports experiments on proposed conditions for open-ended evolution, with evidence discussed in Soros's doctoral dissertation.

Review note: Tests of necessary conditions do not prove sufficient conditions or indefinitely sustained open-endedness.

<https://stars.library.ucf.edu/etd/5965/>

C013 Clusters

primary source reviewed · Supplied CSV

Ventrella's asymmetric particle-interaction simulation produces self-organized collective patterns from species-dependent motion rules.

Review note: Clusters inspired Tom Mohr's Particle Life; the names are not exact aliases. Canonicalize to Clusters and record lineage.

<https://www.ventrella.com/Clusters/>

C014 Conway Game of Life

primary source reviewed · Supplied CSV

Two-state cellular automaton whose local birth and survival rules support complex patterns and engineered computation.

Review note: Pattern multiplication and universal computation do not establish Darwinian evolution or general cognition.

<https://ibiblio.org/lifepatterns/october1970.html>

C015 Core War

primary source reviewed · Supplied CSV

Programs written in Redcode compete for survival in shared virtual memory under a specified interpreter.

Review note: Original source was a 2026 Digital Red Queen paper. Core War itself is a competitive programming arena; evolutionary training belongs to particular extensions.

<https://www.ccapitalia.net/descarga/docs/1984-core-war-guidelines.pdf>

C016 Cosmos

primary source reviewed · Supplied CSV

Tim Taylor and John Hallam's self-replicating-program system extends Tierra with simplified cellular-organism modeling.

Review note: Exploring multicellularity is a research aim, not evidence that a Cambrian-style transition was achieved.

<https://www.tim-taylor.com/paper-details/taylor1997studying.html>

C017 Darwin Pond

primary source reviewed · Supplied CSV

Swimmers evolve anatomy and motion across generations in an interactive artificial-life pond.

Review note: Separate research start from release; retain as precursor to Gene Pool, not an alias of it.

<https://www.ventrella.com/Darwin/darwin.html>

C018 DarwinBots

primary source reviewed · Added in this audit

Program-controlled organisms feed, reproduce and mutate in a continuous two-dimensional world.

Review note: No fixed external fitness target does not by itself establish sustained open-ended evolution.

<https://digilander.libero.it/darwinbots/>

C019 DISHTINY

primary source reviewed · Added in this audit

Self-replicating digital cells form cooperative groups, share resources and coordinate behavior through evolved event-driven programs.

Review note: A direct comparator for cooperation and transitions in individuality; results depend on the specified environment.

<https://mmore500.com/2020/06/26/regulation-dishtiny.html>

C020 Division Blocks

primary source reviewed · Supplied CSV

Physically simulated blocks grow, divide, form joints and exchange resources under evolved recurrent neural controllers in a solar-energy environment.

Review note: Source describes approximately conserved energy and preliminary cooperative resource transactions; preserve those qualifications.

<https://faculty.hampshire.edu/lspector/db-gecco-2007/>

C021 Echo

primary source reviewed · Supplied CSV

Holland's model uses interacting, resource-dependent agents to explore adaptation and organization.

Review note: The cited 2000 study concludes that tested Echo runs lacked the diversity of hierarchical aggregates characteristic of complex adaptive systems; it is not blanket validation.

<https://people.reed.edu/~mab/publications/index.html>

C022 ERO / Evolving Virtual Creatures Revisited

primary source reviewed · Supplied CSV

Peter Krčah's reimplementations evolve virtual-creature morphology and controllers for walking and swimming using ODE physics.

Review note: Original source was wrong: 493.pdf is Vít Růžička's 2014 Framsticks bachelor's thesis. Correct author is Peter Krčah.

<https://gpbib.cs.ucl.ac.uk/gecco2007/docs/p341.pdf>

C023 Evolve 4.0

partial source reviewed · Supplied CSV

Ken Stauffer's artificial-life simulator models evolving program-controlled organisms; the linked repository preserves a later fork.

Review note: Do not describe a 12-commit historical fork as maintained without release/activity evidence.

<https://github.com/rubberduck203/Evolve>

C024 Flow-Lenia

primary source reviewed · Supplied CSV

A mass-conserving Lenia extension localizes update parameters, enabling coexisting patterns and parameter mixing.

Review note: Use Flow-Lenia as canonical spelling; do not convert future potential into achieved open-ended evolution.

<https://arxiv.org/abs/2212.07906>

C025 Framsticks

primary source reviewed · Supplied CSV

A simulation platform models creature bodies and neural controllers, supporting optimization, coevolution, and ecological experiments.

Review note: A platform's support for an experiment does not prove that every run exhibits its target behavior.

<https://www.framsticks.com/>

C026 GARD

partial source reviewed · Added in this audit

An artificial-chemistry model studies mutually catalytic molecular assemblies, compositional inheritance and growth followed by division.

Review note: Compositional heredity differs from sequence copying; broad evolvability claims need separate evidence.

<https://pmc.ncbi.nlm.nih.gov/articles/PMC18166/>

C027 Geb

primary source reviewed · Supplied CSV

A biotically selected neural-agent system studies long-term evolutionary activity and scaling of individual complexity.

Review note: The result is qualified by evaluated run scales and requires scaling both world size and neural limits. Remove timeless 'only besides Earth' superlative.

<https://pubmed.ncbi.nlm.nih.gov/31150288/>

C028 Gene Pool / Swimbots

primary source reviewed · Supplied CSV

Swimbots inhabit an interactive pond with food, mutation, reproduction, and selectable mate preferences.

Review note: Gene Pool and Swimbots refer to one catalog entry; 1997 origin was not independently established in the reviewed page.

<https://www.swimbots.com/genepool/>

C029 GOLEM

primary source reviewed · Supplied CSV

Simulation evolves body and controller designs that are transferred into fabricated locomoting robots.

Review note: Automated design and fabrication pipeline is not autonomous robot self-reproduction; assembly and manufacturing interventions matter.

<https://web.mit.edu/people/hlipson/papers/design.pdf>

C030 JaxLife

primary source reviewed · Added in this audit

Neural-network-controlled agents evolve in a world with programmable robots; the authors analyze communication, agriculture and tool use.

Review note: Reported emergent behaviors are experimental findings; an open-ended title does not prove indefinitely increasing complexity.

<https://arxiv.org/abs/2409.00853>

C031 JohnnyVon

primary source reviewed · Added in this audit

Particle automata with discrete internal states and continuous simulated physics assemble into self-replicating strings.

Review note: Particle-mediated replication is a useful contrast to program-level fission; it does not establish unbounded evolution.

<https://arxiv.org/abs/cs/0212010>

C032 Karl Sims Evolved Virtual Creatures

primary source reviewed · Supplied CSV

Evolutionary algorithms co-design block-based morphology and control for tasks including swimming, walking, and competition.

Review note: Keep fitness-driven body/control evolution distinct from self-reproduction occurring inside a persistent ecosystem.

<https://www.karlsims.com/evolved-virtual-creatures.html>

C033 Langton's Ant

partial source reviewed · Supplied CSV

A rule-following agent changes grid states while moving, producing complex trajectories from simple local rules.

Review note: The ant is a programmed dynamical system; the familiar highway does not imply learning or evolution.

<https://deepblue.lib.umich.edu/bitstream/handle/2027.42/26022/0000093.pdf>

C034 Langton's Loops

primary source reviewed · Supplied CSV

A cellular-automaton loop copies its circulating description to construct further loops.

Review note: Self-reproduction does not require universal construction; standard loop copying should not be scored as demonstrated adaptive evolution.

<https://www.sciencedirect.com/science/article/pii/0167278984902562>

C035 Larger than Life

primary source reviewed · Supplied CSV

Long-range Life-like cellular automata generalize the neighborhood of the original rule.

Review note: Correct attribution: the cited RealLife paper is by Marcus Pivato, not Evans.

<https://arxiv.org/abs/math/0503504>

C036 Lenia

primary source reviewed · Supplied CSV

Continuous cellular automata support localized patterns with movement, self-organization, and other life-like dynamics.

Review note: Project began in 2015; 2018 refers to initial public paper/video. Later extensions include replication-like behavior; version must be specified.

<https://chakazul.github.io/lenia.html>

C037 Nanopond

primary source reviewed · Supplied CSV

A compact artificial-life virtual machine supports interacting program-like organisms; the cited fork modifies instructions, energy limits, and statistics.

Review note: Input's 2011 date is misleading as origin; original code is documented as 2005. Label the cited Chris Hixon fork explicitly.

<https://github.com/ChrisHixon/nanopond>

C038 Network Tierra

primary source reviewed · Supplied CSV

An extension of Tierra distributes digital-organism populations across networked environments.

Review note: Retain as a Tierra extension with shared family; do not count it as wholly unrelated or infer evolved multicellularity from its name.

<https://tomray.me/tierra/>

C039 Neural Particle Automata

primary source reviewed · Added in this audit

Learned local update rules act on moving particles using differentiable SPH operators, supporting morphogenesis and regeneration.

Review note: Learned morphogenesis is distinct from hereditary reproduction and ecological selection.

<https://arxiv.org/abs/2601.16096>

C040 Particle Lenia

partial source reviewed · Supplied CSV

A particle-based reformulation explores Lenia-like self-organizing patterns.

Review note: Linked tutorial is dated January 16, 2023; it does not itself verify the asserted 2022 origin.

<https://observablehq.com/@znah/particle-lenia-from-scratch>

C041 Pezzza's AntSimulator

partial source reviewed · Supplied CSV

Interactive two-dimensional ant simulation demonstrates local movement and marker-mediated foraging in environments with food and obstacles.

Review note: Original row points to an entire YouTube channel. Version and implementation must be pinned; no neural-learning claim established.

<https://github.com/johnBuffer/AntSimulator>

C042 Polyworld

partial source reviewed · Supplied CSV

An artificial-life research environment couples evolving organisms, neural controllers, and ecological interactions.

Review note: The linked repository is an old copy, not evidence of a currently maintained release; no current version benchmark was run.

<https://github.com/erjiang/polyworld-temp>

C043 Primer natural-selection simulations

partial source reviewed · Supplied CSV

Educational simulation videos illustrate how resource competition and inherited variation affect populations over generations.

Review note: Treat the series as one educational project family; do not count each video or animation as a separate research platform.

<https://www.youtube.com/watch?v=0ZGbIKd0XrM>

C044 Primordial Particle Systems

primary source reviewed · Supplied CSV

Self-propelled particles under a simple interaction law form structures that grow, divide, and interact.

Review note: Emergent cell-like reproduction is reported; genome-based heredity and sustained adaptive novelty require separate evidence.

<https://pubmed.ncbi.nlm.nih.gov/27901107/>

C045 Rule 110

primary source reviewed · Supplied CSV

A one-dimensional binary cellular automaton supports universal computation under carefully constructed initial conditions.

Review note: Turing universality is not open-ended biological evolution; distinguish rule history from proof publication.

<https://arxiv.org/abs/0906.3248>

C046 SDSR loops and Evoloop

primary source reviewed · Supplied CSV

Related cellular-automata systems add structural dissolution to replicating loops; Evoloop additionally supports heritable variation through interactions and selection.

Review note: Input slash obscures two distinct rules. Retained as one clearly labeled family entry; do not count it as two without splitting records.

<https://bingdev.binghamton.edu/sayama/sdsr/>

C047 Sebastian Lague ecosystem simulation

partial source reviewed · Supplied CSV

Educational simulation explores rabbit and fox populations, resources, inherited traits, and survival tradeoffs.

Review note: Do not treat the original video and unfinished rewrite as identical code releases or established research benchmarks.

https://www.youtube.com/watch?v=r_It_X7v-1E

C048 Sensorimotor Lenia

primary source reviewed · Added in this audit

Gradient-based optimization and curriculum exploration discover robust moving, self-maintaining patterns in continuous cellular automata.

Review note: A distinct research extension within the Lenia family; trained robustness is not a proof of lifetime learning or consciousness.

<https://developmentalsystems.org/sensorimotor-lenia/>

C049 SmoothLife

primary source reviewed · Supplied CSV

A continuous-domain generalization of Conway's Life supports smooth dynamical patterns.

Review note: Pattern dynamics alone do not establish heredity, selection, or cognition.

<https://arxiv.org/abs/1111.1567>

C050 Squirm3

partial source reviewed · Supplied CSV

An artificial chemistry models interacting particles and evolvable self-replicating molecular structures.

Review note: A single artificial chemistry is not multiple physical substrates; detailed paper claims were not fully replicated.

<https://github.com/timhutton/squirm3>

C051 Stringmol

primary source reviewed · Supplied CSV

Opcode-string molecules bind probabilistically and execute reactions, enabling studies of replication, mutation and evolving molecular interactions.

Review note: Source supports study of evolved replication; remove unconditional claims that open-endedness is settled or universally quantified.

<https://github.com/uoy-research/Rstringmol>

C052 Sugarscape

partial source reviewed · Supplied CSV

An agent-based artificial society studies how local interactions generate population-level social patterns.

Review note: Detailed model configurations vary; do not assign all book experiments to every Sugarscape implementation.

<https://www.brookings.edu/books/growing-artificial-societies/>

C053 Swarm Chemistry

primary source reviewed · Supplied CSV

Heterogeneous self-propelled particles follow local kinetic rules, producing collective structures; extensions study evolutionary swarm dynamics.

Review note: Separate original interactive Swarm Chemistry from later Evolutionary Swarm Chemistry capabilities.

<https://bingweb.binghamton.edu/~sayama/SwarmChemistry/>

C054 The Bibites

primary source reviewed · Supplied CSV

Artificial-life simulation evolves digital creatures with genetic traits and neural controllers in a resource-based environment.

Review note: Creator's ambitions and promotional language are not evidence of limitless behavior, consciousness, or biologically equivalent life.

<https://www.thebibites.com/>

C055 The Life Engine

primary source reviewed · Supplied CSV

Cellular artificial-life simulator lets organisms eat, reproduce, mutate and compete, with selection arising from survival and offspring production.

Review note: Natural-selection design is documented; sustained unbounded novelty remains a separate empirical claim.

<https://github.com/MaxRobinsonTheGreat/LifeEngine>

C056 Tierra

primary source reviewed · Supplied CSV

Self-replicating programs compete for computational resources and undergo mutation in a virtual environment.

Review note: Use creator's site instead of course mirror; do not infer sustained unbounded innovation from digital evolution alone.

<https://tomray.me/tierra/>

C057 Wireworld

partial source reviewed · Supplied CSV

A four-state cellular automaton models moving signals in conductors and can implement logic circuits.

Review note: Evidence concerns circuit computation; neither intelligence nor biological reproduction follows from universality.

<https://cellpylib.org/wireworld.html>

Method or algorithm

28 entries · descriptions checked to the extent indicated

C058 ASAL

primary source reviewed · Supplied CSV

Foundation models guide searches across artificial-life simulators for target behavior, novelty, and diverse patterns.

Review note: ASAL is a discovery method spanning multiple simulators; its search algorithm and discovered worlds should not be conflated.

<https://sakana.ai/asal/>

C059 Automated Design of Agentic Systems (ADAS)

primary source reviewed · Supplied CSV

Meta-agent search generates and evaluates agent programs, retaining prior designs to inform subsequent discoveries.

Review note: An automated design method, not a population of metabolizing autonomous organisms.

<https://arxiv.org/abs/2408.08435>

C060 Darwin Gödel Machine (DGM)

primary source reviewed · Supplied CSV

Foundation-model-driven search modifies coding-agent programs, evaluates changes on coding benchmarks, and accumulates an archive of agent variants.

Review note: Title is not evidence for a maximum OEE score. Benchmark improvement and growing archives do not prove indefinite innovation.

<https://arxiv.org/abs/2505.22954>

C061 DERL / UNIMAL

primary source reviewed · Supplied CSV

Evolution searches articulated morphologies while reinforcement learning trains control, studying embodiment and learnability across environments.

Review note: Merge UNIMAL row into this entry: UNIMAL is the design space in the same framework, not an independent comparison project.

<https://arxiv.org/abs/2102.02202>

C062 Digital Red Queen

primary source reviewed · Added in this audit

LLM-driven self-play evolves Core War programs against previous opponents, studying adaptation to a changing adversarial objective.

Review note: Distinct method built on Core War; it is not the 1984 Core War source and not evidence of unbounded innovation.

<https://arxiv.org/abs/2601.03335>

C063 El Farol bar problem

primary source reviewed · Supplied CSV

Boundedly rational agents select attendance predictions and decide whether to visit a bar, creating collective congestion dynamics.

Review note: Predictor switching is adaptation; do not describe every implementation as genetic evolution.

<https://ccl.northwestern.edu/netlogo/models/ElFarol>

C064 Enhanced POET

primary source reviewed · Supplied CSV

Co-generates learning challenges and agents, allowing solution transfer among tasks and measuring exploration progress.

Review note: Evidence concerns the reported algorithm and experiments; a title containing unbounded does not establish limitless real-world novelty.

<https://arxiv.org/abs/2003.08536>

C065 ES-HyperNEAT

primary source reviewed · Supplied CSV

An extension infers hidden-neuron placement and density from an indirect connectivity encoding.

Review note: A distinct HyperNEAT extension, not an independent organism world; finite experiments do not establish unrestricted complexity growth.

<https://direct.mit.edu/artl/article/18/4/331/2720/An-Enhanced-Hypercube-Based-Encoding-for-Evolving>

C066 Evolution through Large Models (ELM)

primary source reviewed · Supplied CSV

Code language models supply mutation operators within evolutionary search, demonstrated on programs that generate Sodarace walkers.

Review note: Algorithmic inheritance in search is distinct from autonomous in-world reproduction; linked to OpenELM implementation family.

<https://arxiv.org/abs/2206.08896>

C067 Evolving Soft Robots (Cheney / Unshackling Evolution)

primary source reviewed · Supplied CSV

Evolution combines generative encodings and multiple voxel materials to discover locomoting soft-body robot designs.

Review note: Input DOI points to a 2014 SIGEVolution version; original experiment appeared at GECCO 2013. This is externally optimized design, not ecological reproduction.

<https://www.cs.swarthmore.edu/~meeden/DevelopmentalRobotics/SoftBots.pdf>

C068 Genesys / Tracker

primary source reviewed · Supplied CSV

Genesys evolves bit-string-encoded programs, including finite-state and neural controllers, with Tracker studying behavior on an artificial-ant task.

Review note: Task-specific evolutionary optimization does not imply lifetime learning or open-ended ecology; different controller encodings are alternatives.

<https://web.cs.ucla.edu/~dyer/Papers/AlifeTracker/Alife91Jefferson.html>

C069 Go-Explore

primary source reviewed · Supplied CSV

Exploration algorithms archive promising states, return to them, and explore further; demonstrated on sparse-reward games and robotic tasks.

Review note: Exploration performance does not establish indefinitely sustained open-ended evolution.

<https://arxiv.org/abs/2004.12919>

C070 HyperNEAT

primary source reviewed · Supplied CSV

An indirect encoding generates neural connectivity from geometric patterns, exploiting symmetry and repeated structure.

Review note: Retain as a distinct algorithm in the NEAT family; avoid scoring interchangeable computational encodings as physical substrate diversity.

https://staff.fmi.uvt.ro/~daniela.zaharie/ma2017/projects/techniques/EvolvingDeepNN/HyperNEAT_stanley_alife09.pdf

C071 Innovation Engines

primary source reviewed · Supplied CSV

Deep-network assessments guide divergent evolutionary search for recognizable artifacts; the original demonstration generates images.

Review note: Original paper distinguishes a long-term vision from a simplified implemented demonstration.

https://yosinski.com/media/papers/Nguyen__2015__GECCO__Innovation_engines_Automated_creativity_and_improved_stochastic_opt.pdf

C072 MAP-Elites

primary source reviewed · Supplied CSV

An archive retains high-performing solutions across user-chosen behavioral or phenotypic descriptor regions.

Review note: Quality-diversity coverage is not unlimited open-ended evolution; descriptor dimensions and evaluation rules are supplied.

<https://arxiv.org/abs/1504.04909>

C073 Minimal Criterion Coevolution (MCC)

primary source reviewed · Supplied CSV

Maze populations and navigating agents coevolve under minimal success criteria, producing diverse maze structures and agent behaviors.

Review note: The abstract calls this a step toward open-ended algorithms; 'indefinitely growing complexity' exceeds the evidence.

<https://stars.library.ucf.edu/scopus2015/7496/>

C074 NEAT

primary source reviewed · Supplied CSV

An evolutionary algorithm optimizes neural weights and topology using speciation, structural innovation tracking, and incremental complexification.

Review note: An algorithm does not intrinsically have ecology, reproduction in a world, or visual scale; these are application-dependent.

<https://nn.cs.utexas.edu/downloads/papers/stanley.ec02.pdf>

C075 NerveNet

partial source reviewed · Supplied CSV

A graph neural network uses an agent's body structure to parameterize a continuous-control policy.

Review note: Policy architecture alone is not an evolved body or complete artificial-life ecosystem.

<https://openreview.net/pdf?id=S1sqHMCb>

C076 Neural Graph Evolution (NGE)

primary source reviewed · Supplied CSV

Evolutionary graph search designs robots while graph-network controllers transfer skills among candidate bodies.

Review note: Selection and mutation occur in a design algorithm; do not conflate with autonomous physical self-reproduction.

<https://arxiv.org/abs/1906.05370>

C077 Novelty Search

primary source reviewed · Supplied CSV

Evolutionary search rewards behavioral novelty instead of direct objective progress.

Review note: Novelty search can explore without a task objective, but novelty metrics and representation constrain results.

https://www.cs.swarthmore.edu/~meeden/DevelopmentalRobotics/lehman_ecj11.pdf

C078 OMNI

primary source reviewed · Supplied CSV

Foundation models estimate task interestingness to prioritize learnable, interesting tasks for an agent's curriculum.

Review note: Task generation is not organism reproduction; no universal OEE score follows from the title.

<https://arxiv.org/abs/2306.01711>

C079 OMNI-EPIC

primary source reviewed · Supplied CSV

Foundation models generate environment and reward code for tasks selected to be interesting and appropriate to agents' capabilities.

Review note: A distinct extension of OMNI in the same family; in-principle unrestricted task generation does not prove indefinite realized novelty.

<https://arxiv.org/abs/2405.15568>

C080 Promptbreeder

primary source reviewed · Supplied CSV

Evolutionary procedure adapts task prompts and the mutation prompts used to generate their variants.

Review note: Optimization over task prompts has fixed evaluation domains; distinguish prompt evolution from organism self-replication.

<https://arxiv.org/abs/2309.16797>

C081 Quality-Diversity through AI Feedback (QDAIF)

primary source reviewed · Supplied CSV

Language models generate variations and assess quality and diversity within an evolutionary search over creative text.

Review note: Coverage of a specified search space is not unrestricted open-ended evolution.

<https://arxiv.org/abs/2310.13032>

C082 RoboGrammar

primary source reviewed · Supplied CSV

Graph grammars define robot structures, and heuristic search optimizes designs and controllers for terrain tasks.

Review note: Replace unstable generic redirect with specific project page; an optimizer is not a self-maintaining ecosystem.

<https://people.csail.mit.edu/jiex/papers/robogrammar/>

C083 Schelling segregation model

primary source reviewed · Supplied CSV

Local relocation decisions based on neighborhood composition can produce large-scale segregation without equally strong individual preferences.

Review note: A foundational social model, not an evolving organism platform; implementations are variants of one model family.

<https://doi.org/10.1080/0022250X.1971.9989794>

C084 Transform2Act

primary source reviewed · Supplied CSV

A graph-based policy first modifies body structure and then controls the resulting agent, jointly optimizing morphology and behavior.

Review note: 2021 preprint; ICLR 2022 publication. Learned design actions are not organism reproduction.

<https://arxiv.org/abs/2110.03659>

C085 von Neumann Universal Constructor

partial source reviewed · Supplied CSV

A theoretical cellular-automaton construction separates a machine's description, interpretation, and copying to enable self-reproduction.

Review note: Distinguish 1940s-1950s work from the posthumous 1966 publication; the constructor alone and complete reproducer are different components.

<https://fab.cba.mit.edu/classes/862.16/notes/computation/vonNeumann-1966.pdf>

Simulation toolkit

24 entries · descriptions checked to the extent indicated

C086 Agents.jl

primary source reviewed · Added in this audit

A Julia framework supports discrete-time and event-based agent models with spatial environments, analysis tools and ecosystem examples.

Review note: Separate framework features from the ecological or learning behavior of an individual model.

<https://juliadynamics.github.io/Agents.jl/stable/>

C087 ARGoS

primary source reviewed · Added in this audit

A modular multi-physics simulator supports experiments with large robot swarms and configurable robot and physics plugins.

Review note: A swarm-robotics comparator; robot population size alone is not evolutionary or ecological complexity.

<https://www.argos-sim.info/>

C088 Ascape

primary source reviewed · Supplied CSV

Agent-based modeling framework built around composable scapes, with facilities for rules, visualization, statistics, and experiments.

Review note: Framework capabilities should not be scored as a particular organism or ecosystem.

<https://ascape.sourceforge.net/manual/Overview.html>

C089 Avida-ED

primary source reviewed · Supplied CSV

Educational software lets users design experiments with evolving digital organisms and inspect results.

Review note: Avida-ED belongs to Avida's family; it is an educational application, not an independent evolutionary lineage. 2009 is an education-paper date, not necessarily software inception.

<https://avida-ed.github.io/>

C090 BioDynaMo

primary source reviewed · Added in this audit

An open-source platform supports creation, execution and visualization of agent-based simulations, including biological and ecological models.

Review note: Scale and performance require matched model and hardware benchmarks; no cross-platform speed claim is adopted here.

<https://www.biodynomo.org/>

C091 breve

primary source reviewed · Supplied CSV

An open-source three-dimensional multi-agent environment supports simulations of decentralized systems and artificial life.

Review note: Replaced nonresponsive old homepage; framework is not a single self-reproducing organism ecosystem.

<https://sourceforge.net/projects/breve/>

C092 EcoLab

primary source reviewed · Added in this audit

A C++ agent-based modeling system influenced by Swarm provides infrastructure for computational experiments.

Review note: Distinguish the EcoLab software framework from the particular evolving-ecology models studied with it.

<https://arxiv.org/abs/cs/0401026>

C093 Empirical

primary source reviewed · Added in this audit

A C++ scientific-software library supplies evolution, systematics and browser-interface tools used to build reproducible computational experiments.

Review note: Infrastructure rather than a single evolving world; distinct from systems implemented with it, including DISHTINY.

<https://empirical.readthedocs.io/en/latest/>

C094 Evoplex

primary source reviewed · Added in this audit

A platform for agent models on networks separates model code, experiment parameters and visualization to support repeatable simulations.

Review note: Useful for network interactions and evolutionary games; specific heredity and ecological rules are model-dependent.

<https://arxiv.org/abs/1811.10116>

C095 EvoSoro

primary source reviewed · Added in this audit

A Python library built on Voxelyze supports dynamic simulation and automated design of soft multimaterial robots.

Review note: A distinct design library in the Voxelyze family; do not count its physics engine twice in a family-level comparison.

<https://github.com/skriegman/evosoro>

C096 FLAME GPU

primary source reviewed · Added in this audit

A GPU agent-modeling framework supplies agent types, communication and birth/death operations through CUDA C++ and Python interfaces.

Review note: Birth/death API support is not automatically hereditary evolution; compare performance on equivalent agent rules.

<https://flamegpu.com/>

C097 GAMA Platform

primary source reviewed · Supplied CSV

Agent-based simulation platform with spatial modeling, a modeling language, visualization, and experimentation facilities.

Review note: Remove universal claims about scale and absent physics unless version-specific benchmarks or module documentation support them.

<https://gama-platform.org/wiki/Home>

C098 MABE

primary source reviewed · Supplied CSV

Modular framework combines genomes, brains, worlds, optimizers, and data archiving for evolutionary experiments.

Review note: Swappable brain modules are alternative experiment components, not evidence of simultaneous physical substrates.

<https://github.com/Hintzelab/MABE>

C099 MASON

primary source reviewed · Supplied CSV

Java agent-based simulation library with optional visualization and extensions for distributed simulations, GIS, discrete events, and two-dimensional physics.

Review note: Blanket claim of no physical body simulation is false: official distribution lists a physics2d rigid-body extension.

<https://people.cs.gmu.edu/~eclab/projects/mason/>

C100 Mesa

primary source reviewed · Supplied CSV

Python framework for building agent-based models, collecting data, visualizing behavior, and analyzing experiments.

Review note: Reproduction and learning depend on user models; an empty framework should not receive organism trait scores.

<https://mesa.readthedocs.io/stable/>

C101 NetLogo

primary source reviewed · Supplied CSV

Programmable agent-based modeling environment with a model library, visualization, and experiment tools; behavior depends on the particular model.

Review note: Remove unsupported 'world's most-used' superlative; do not assign toolkit-wide reproduction or cognition.

<https://www.netlogo.org/index>

C102 OpenELM (CarperAI)

primary source reviewed · Supplied CSV

CarperAI library supports evolutionary search over code and natural language using language-model mutation operators and example environments.

Review note: Not Apple's separate OpenELM language-model family. Keep implementation and paper linked; do not imply independent conceptual lineage.

<https://github.com/CarperAI/OpenELM>

C103 OpenSteer

primary source reviewed · Supplied CSV

C++ library for steering autonomous characters, including behaviors useful in games, animation, and collective-motion demonstrations.

Review note: Related to Boids, but a reusable library rather than a duplicate flocking model.

<https://github.com/meshula/OpenSteer>

C104 Physis

partial source reviewed · Supplied CSV

A research platform investigates evolvability in assembly-like computational languages.

Review note: Sparse documentation supports identity and intent; detailed reproduction mechanics and performance were not independently verified.

<https://sourceforge.net/projects/physis/>

C105 Repast

primary source reviewed · Supplied CSV

Family of agent-based modeling frameworks supporting interactive and distributed simulations in multiple programming languages.

Review note: The platform enables custom models; ecology, cognition, and heredity are model-specific rather than intrinsic suite properties.

<https://repast.github.io/>

C106 StarLogo

primary source reviewed · Supplied CSV

Programmable educational modeling environment for decentralized systems such as flocks, traffic, and markets.

Review note: Classic StarLogo, TNG and Nova are related versions; avoid mixing their capabilities without naming a version.

<https://web.mit.edu/mitstep/starlogo/info.html>

C107 Swarm

primary source reviewed · Supplied CSV

A reusable software framework supports hierarchical multi-agent models and tools for conducting simulation experiments.

Review note: Toolkit capabilities must be separated from the ecological or evolutionary properties of models built with it.

<https://sfi-edu.s3.amazonaws.com/sfi-edu/production/uploads/sfi-com/dev/uploads/filer/8a/2a/8a2ae001-9ad5-43e6-b7e3-4d951223e9e8/96-06-042.pdf>

C108 Voxcraft-sim

primary source reviewed · Supplied CSV

GPU-accelerated voxel-based physics engine supports soft-body simulation and experiments with physically embodied designs.

Review note: Related to Voxelyze/VoxCAD but distinct software; physics engine alone is not an evolution algorithm or ecosystem.

<https://github.com/voxcraft/voxcraft-sim>

C109 Voxelyze / VoxCAD

primary source reviewed · Supplied CSV

Voxelyze provides voxel-based mechanics; VoxCAD supplies a modeling and simulation interface around related components.

Review note: These are related engine/interface components. Count as a tool family; reproduction and evolution depend on added algorithms.

<https://github.com/jonhiller/VoxCAD>

Game or creative sandbox

18 entries · descriptions checked to the extent indicated

C110 Biomorphs / Blind Watchmaker

partial source reviewed · Supplied CSV

Users select branching forms whose encoded parameters mutate between generations, demonstrating a genotype-to-form mapping.

Review note: Keep human selection explicit; original Brandeis page misstates the first book year as 1987.

<https://aronnax9000.github.io/WatchmakerSuite/>

C111 Cell Lab: Evolution Sandbox

primary source reviewed · Supplied CSV

Simulation puzzle game lets users design genomes for few-celled organisms that must survive specified environments.

Review note: Separate user-engineered genomes and challenge solving from claims of unbounded autonomous evolution.

<https://cell-lab.net/>

C112 Creatures

primary source reviewed · Supplied CSV

Digital pets combine inherited biochemical and neural structures with lifetime adaptation in an interactive environment.

Review note: Scope claims to the described product/version; neural learning does not establish conscious experience.

<https://citeseerx.ist.psu.edu/document?doi=a2d90ae4b2ac467c75e3104dcf8d8c1e1d80a20c&repid=rep1&type=pdf>

C113 Electric Sheep

primary source reviewed · Added in this audit

A distributed generative-art system evolves abstract animations using viewer votes as a genetic-algorithm fitness signal.

Review note: Interactive aesthetic selection is a different task from autonomous ecological evolution.

<https://draves.org/npar06/>

C114 EndlessForms

primary source reviewed · Supplied CSV

Users collaboratively evolve CPPN-encoded three-dimensional shapes and can fabricate selected shapes with 3D printing.

Review note: Interactive human selection and static shape generation do not establish autonomous ecology or agent cognition.

https://yosinski.com/media/papers/Clune__2012__EndlessFormscomCollaborativelyEvolvingObjectsAnd3DPrinting.pdf

C115 Keiwan Evolution

primary source reviewed · Supplied CSV

User-designed virtual creatures are optimized through evolutionary algorithms in a sandbox simulation.

Review note: Separate body construction by the user from evolved controller behavior; no automatic evolution of unrestricted morphology established.

<https://github.com/keiwando/evolution>

C116 Noita

primary source reviewed · Supplied CSV

Action roguelite uses material-based pixel simulation alongside rigid-body, thermal, electrical and simplified chemical interactions.

Review note: Materials simulation and procedural worlds do not make it an autonomous evolution platform.

<https://noitagame.com/>

C117 Picbreeder

primary source reviewed · Supplied CSV

Users collaboratively evolve images, share results, and branch from other users' designs.

Review note: Human judgment drives selection. Broad exploration is not equivalent to autonomous unbounded evolution.

<https://pubmed.ncbi.nlm.nih.gov/20964537/>

C118 Sandspiel

primary source reviewed · Supplied CSV

Browser-based creative cellular-automata sandbox lets users combine simulated materials into interactive scenes.

Review note: Creative materials simulation does not itself demonstrate heredity, selection, or autonomous open-ended evolution.

<https://github.com/MaxBittker/sandspiel>

C119 SimAnt: The Electronic Ant Colony

primary source reviewed · Supplied CSV

Ant-colony simulation combines player control, foraging, territorial competition, predators, and colony management.

Review note: Correct subtitle is Electronic, not Electric. Reproducing ants and colony growth differ from genetic evolutionary search.

https://www.abandonware.com/public/aban_files_giochi/simantmanual.pdf

C120 SimEarth: The Living Planet

primary source reviewed · Supplied CSV

Planet-scale simulation couples geosphere, atmosphere, climate, broad life classes, and civilization over selectable timescales.

Review note: A coarse planetary model; its evolution mechanics are not per-organism inherited genomes.

<https://www.abandonware.com/docawd.php?idg=631&sf=simearth-manual.txt&sg=SimEarth&st=manual>

C121 SimLife: The Genetic Playground

primary source reviewed · Supplied CSV

Ecosystem simulation lets players alter organisms' genetics and environmental conditions and observe adaptation and population change.

Review note: Publisher claims establish intended features, not independently validated scientific fidelity; avoid marketing superlatives.

<https://gordonbell.azurewebsites.net/TCMwebpage/CHMfiles/Sim%20Art%20-%20SimLife%20Computer%20Games%201992.pdf>

C122 Soda Constructor / Sodarace

primary source reviewed · Supplied CSV

Related tools support constructing mass-spring creatures and racing them; Sodarace Kiosk also evolves mutated designs using speed-based selection.

Review note: Input incorrectly says the tool evolves nothing. Constructor editing and Kiosk evolutionary mode must be distinguished; retain one grouped family entry.

<https://teachinglondoncomputing.org/wp-content/uploads/2015/01/activity-sodaraceevolution.pdf>

C123 Species: Artificial Life, Real Evolution

primary source reviewed · Supplied CSV

Evolution sandbox simulates creatures that mutate, reproduce and respond to environmental selection, with player intervention.

Review note: Historical project start and Steam release are different dates. Storefront marks a long update gap; no claim of active development.

https://store.steampowered.com/app/774541/Species_Artificial_Life_Real_Evolution/

C124 Spore

primary source reviewed · Supplied CSV

Commercial creation game lets players design creatures and progress through several scales of an imagined life history.

Review note: Player-guided creature design is not evidence of autonomous Darwinian evolution; avoid declaring absence of all inheritance mechanisms.

<https://www.ea.com/games/spore/spore>

C125 TechnoSphere

partial source reviewed · Added in this audit

An interactive artificial-life artwork populated a virtual environment with creatures assembled by online participants.

Review note: Historical art/ecology comparison only; no claim about current software availability or detailed evolutionary mechanisms.

<https://www.jstor.org/stable/1576397>

C126 The Powder Toy

primary source reviewed · Supplied CSV

Particle-physics sandbox simulates materials, heat, air pressure, and interactions in user-created scenes.

Review note: A general sandbox; user-built life-like contraptions should not be conflated with built-in evolutionary ecology.

<https://github.com/The-Powder-Toy/The-Powder-Toy>

C127 Thrive

primary source reviewed · Supplied CSV

Open-source evolution game combines organism editing with simulated environmental competition; its documented development focuses on early life stages.

Review note: Seven stages are a roadmap, not delivered scope. Avoid asserting current playable stages beyond a versioned release check.

https://wiki.revolutionarygamesstudio.com/wiki/What_is_Thrive

Biological or developmental model

13 entries · descriptions checked to the extent indicated

C128 Artificial Anasazi

partial source reviewed · Supplied CSV

Household-based archaeological simulation studies population and settlement patterns in Long House Valley using reconstructed environmental conditions.

Review note: Correct DOI is 10.1073/pnas.092080799, not input's 10.1073/pnas.082081199. Empirical comparison is not blanket model validation.

<https://pmc.ncbi.nlm.nih.gov/articles/PMC128597/>

C129 Chaste

primary source reviewed · Added in this audit

A computational biology package supports cell populations, tissue modeling and cardiac electrophysiology with extensible scientific software.

Review note: Biological fidelity and validation are separate from general-purpose ALife breadth.

<https://chaste.github.io/>

C130 CompuCell3D

primary source reviewed · Added in this audit

A scriptable virtual-tissue modeling environment uses Cellular Potts dynamics for multiscale multicellular simulations.

Review note: Compare coupled tissue mechanics and biological modeling; capabilities of a framework depend on the chosen model.

<https://compuCell3d.org/>

C131 DevoWorm

primary source reviewed · Supplied CSV

Open-science project studies developmental dynamics, digital morphogenesis, and developmental plasticity, with a strong focus on *C. elegans*.

Review note: An affiliated research program with several efforts, not a single complete coupled organism simulator. Shared family with OpenWorm.

<https://docs.openworm.org/Projects/DevoWorm/>

C132 Gray-Scott Reaction-Diffusion

primary source reviewed · Supplied CSV

Coupled reaction-diffusion equations generate spatial patterns, including spots that can split.

Review note: 1993 refers to Pearson's pattern study, not the origin of all Gray-Scott chemistry; splitting spots is not genetic reproduction.

<https://mrob.com/sci/talks/20101209.html>

C133 Growing Neural Cellular Automata

primary source reviewed · Supplied CSV

A learned local update rule grows target patterns from seeds and can support persistence and regeneration.

Review note: Training a developmental rule is not evidence of an organism learning during life or reproducing with heritable variation.

<https://distill.pub/2020/growing-ca/>

C134 Morpheus

primary source reviewed · Added in this audit

A modeling environment couples cell-based models, ordinary differential equations and reaction-diffusion systems with a graphical experiment workflow.

Review note: A strong counterexample to treating coupled modeling formalisms as unique to CQM; not an autonomous evolved ecosystem by default.

<https://morpheus.gitlab.io/>

C135 Morphozoic

primary source reviewed · Supplied CSV

Cellular-automata framework models morphogenesis using nested neighborhoods to represent local and broader contextual signals.

Review note: Replace secondary bibliographic page with author source; capability objectives are not all demonstrated outcomes.

<https://tom.portegys.com/research/Morphozoic.pdf>

C136 OpenWorm

primary source reviewed · Supplied CSV

Open-source research integrates nervous-system, muscle, soft-tissue, and fluid models toward a simulated *C. elegans*.

Review note: Describe an ongoing modeling effort; do not imply that every component forms a validated complete organism.

<https://openworm.org/>

C137 PhysiCell

primary source reviewed · Supplied CSV

Agent-based simulator couples cellular mechanics and phenotypes to diffusing biochemical substrates for studies of multicellular systems.

Review note: Here 'substrates' includes diffusible chemical species; do not translate that directly into a computational-substrate superiority score.

<https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1005991>

C138 SLiM

primary source reviewed · Added in this audit

A scriptable, genetically explicit evolutionary simulation framework models population genetics and customizable ecological scenarios.

Review note: Genetic evolution is explicit; artificial agent cognition and morphology are not default capabilities.

<https://github.com/MesserLab/SLiM>

C139 Tissue Forge

primary source reviewed · Added in this audit

An interactive particle-based environment models physics, chemistry and biology across subcellular, cellular and tissue scales.

Review note: Compare interaction among modeling scales; physics and chemistry features alone do not imply evolution or cognition.

<https://tissue-forge-documentation.readthedocs.io/en/latest/>

C140 Xenobots

primary source reviewed · Supplied CSV

Living cell assemblies exhibit designed behaviors; experiments show kinematic replication by gathering loose cells into new motile assemblies.

Review note: Physical biological cells, not purely digital organisms. Replication relies on supplied cells and controlled conditions, not unbounded autonomous reproduction.

<https://www.pnas.org/doi/10.1073/pnas.2112672118>

Cognitive theory or architecture

2 entries · descriptions checked to the extent indicated

C141 Conscious Turing Machine (CTM)

primary source reviewed · Supplied CSV

Formal theoretical-computer-science model expresses a version of global workspace theory using a mathematical machine architecture.

Review note: A formal consciousness model is not evidence that a machine is conscious. Remove 'adopted by nobody' and unsupported numeric theory superiority.

<https://arxiv.org/abs/2107.13704>

C142 LIDA

primary source reviewed · Supplied CSV

Cognitive architecture and software framework model perception, attention, memory, action selection and learning through global-workspace mechanisms.

Review note: Theory-inspired architecture is not proof of consciousness. Remove unsupported adoption claims and ordinal consciousness ranking.

<https://ccrg.cs.memphis.edu/projects.html>

Adjacent AI benchmark

8 entries · descriptions checked to the extent indicated

C143 Craftax

primary source reviewed · Supplied CSV

Accelerated reinforcement-learning benchmark provides procedurally generated survival and crafting environments with complex skill dependencies.

Review note: Open-ended benchmark terminology is distinct from demonstrating open-ended evolution or self-reproduction.

<https://proceedings.mlr.press/v235/matthews24a.html>

C144 Evolution Gym

primary source reviewed · Supplied CSV

A voxel-based benchmark evaluates joint optimization of robot morphology and control across locomotion and manipulation tasks.

Review note: Use 2021 NeurIPS publication rather than 2022 preprint deposit as project date; benchmark is not an autonomous ecosystem.

<https://evolutiongym.github.io/>

C145 Generative Agents (Smallville)

primary source reviewed · Supplied CSV

Language-model agents combine memories, reflection and planning to produce behavior in an interactive small-town simulation.

Review note: Believable social behavior is not evidence of consciousness, ecological realism, or Darwinian evolution.

<https://arxiv.org/abs/2304.03442>

C146 Genie: Generative Interactive Environments

primary source reviewed · Supplied CSV

Learned world model generates action-controllable environments from visual prompts using training on unlabelled video.

Review note: Refers to the original 2024 Genie, not later versions. Learned visual dynamics are not a validated physical simulator.

<https://arxiv.org/abs/2402.15391>

C147 Melting Pot

primary source reviewed · Supplied CSV

Evaluation suite tests social generalization of reinforcement-learning agents across scenarios involving cooperation, competition and resource sharing.

Review note: An evaluation suite, not one autonomous artificial-life world. Do not aggregate scenario capabilities into one organism.

<https://arxiv.org/abs/2107.06857>

C148 Neural MMO

primary source reviewed · Supplied CSV

Research platform combines persistent game systems, large agent populations, long horizons, and tools for multi-agent learning experiments.

Review note: Agent spawning and learned survival behavior do not automatically establish inherited reproduction or evolutionary novelty.

<https://arxiv.org/abs/2110.07594>

C149 The AI Scientist

primary source reviewed · Supplied CSV

Language-model research pipeline generates ideas, implements experiments, writes papers, and applies automated review.

Review note: Automated reviewer ratings are not external peer acceptance. Original cost claim is experiment-specific, not a current cost guarantee.

<https://arxiv.org/abs/2408.06292>

C150 Voyager

primary source reviewed · Supplied CSV

Minecraft agent uses an automatic curriculum, executable skill library and iterative prompting to acquire and reuse skills.

Review note: Skill acquisition with GPT-4 is not organism reproduction or biological heredity.

<https://arxiv.org/abs/2305.16291>

08 Dispositions and review queue

Removal from the counted catalog does not erase the original record. The following entries remain in the audit trail, with a specific disposition rather than a fabricated replacement score.

3D Virtual Creature Evolution (3DVCE)

Unresolved; excluded from counted catalog

Keep as a candidate with unverified detailed claims; do not carry over strong morphology, cognition, or maturity scores.

Only secondary and community pages were located; primary project documentation was not recovered.

[Source reviewed](#)

UNIMAL

Merged into DERL / UNIMAL

Duplicate project-level counting; retain as a documented alias/component only.

Input source is the same DERL paper, with matching authors and Nature DOI.

[Source reviewed](#)

Quality-Diversity (illumination algorithms)

Method glossary; excluded from project count

Generic research category, not an additional independent project. Keep in methods glossary and exclude from project count.

Pugh, Soros, and Stanley 2016 paper identified.

[Source reviewed](#)

Evosphere: PDF-only identification gap

The PDF supplies only “Evosphere (WebGL)” and no author, repository or citation. A potentially matching browser-simulation repository exists, but the supplied PDF does not establish that it is the intended project. Keep the label outside the counted catalog until its provenance is identified; this is not a finding that no such project exists.

[Candidate identity for later confirmation](#)

What the review did not establish

No external simulator was installed or executed. No CQM test suite, runtime, hardware benchmark or live demo was run. Some source checks reached only abstracts, author summaries or limited historical records. The output corrects identity, duplication, citations, core descriptions and interpretation; it does not certify every historical number in the input.

09 Repository evidence appendix

This appendix anchors the CQM assessment in current repository documentation and selected implementation files. Paths below are relative to the repository root. The workbook and evidence JSON preserve the full absolute root, reference HEAD, file hashes, claims and qualifications.

Repository: <https://github.com/0thernes/cosmogonic-quantum-mechalogodrom>

Reference HEAD: 3ab92db558d73b4e84c6576d1d92e76946f2f7f6

Working-tree cleanliness could not be confirmed because Git status/chdir checks failed. Inspected working-file contents may differ from that commit. Findings are tied to the captured SHA-256 hashes, not asserted to be a clean immutable commit snapshot.

Canonical documentation map

README.md

Overview, comparison table and retained negative-result boundaries; stale arithmetic remains in its comparison section.

docs/VERIFICATION-ANALYTICAL-DATA.md

Canonical analytical receipts and caveats, including the 3.8 breadth value and consciousness-indicator limits.

docs/reports/README.md

Experiment register, ecology tests and later V4/Phase-B results.

docs/reports/2026-06-26-alife-comparison-matrix.csv

129-row comparison dataset; parsed content equals the user paste.

docs/XYLOS.md

Current recurrent numeric organism, entropy boundary and replay limitations.

scripts/alife-codeground-sensitivity.ts

Implementation-grounded score rationale, corrections and explicit bounds; source of the old rubric rather than an independent benchmark.

Verification level

Read-only inspection of selected current working files; no suite or simulator executed, no repository edits; arithmetic recomputed independently in Python. HEAD is a reference, not assurance all inspected files equal committed content.

Scope and identity

Browser-hosted artificial-life and cognitive-mechanism research testbed with multiple interacting numerical models. The repository is a prototype; source breadth is not evidence of scientific superiority.

README.md:17-20,760-811; docs/VERIFICATION-ANALYTICAL-DATA.md:31-43

Reproduction

EntityManager implements asexual inheritance and bounded point mutation of nW, strategy, typeId and setGroup. The auto-fission probability is $0.02 + 0.08 * \text{clamp}01(nW)$, with trait-blind 0.06 ablation.

This supports gene-linked fecundity in a bounded simulated population; not instruction-level self-replication, sexual genome evolution or independently replicated multi-generational ecology. Gate source inspected, not executed.

src/sim/entities.ts:477-502,1154-1182; tests/entity-repro-select.test.ts:146-179

Open-endedness

The shipped fecundity objective is monotonic in nW and has a fixed optimum at nW=1. The current scoring script explicitly corrects earlier claims of a GA in emergence-angles, inherited petri selection and fitness-weighted soup parenthood.

No demonstrated sustained open-ended evolution. Authoring new mechanisms or producing novelty does not establish unbounded adaptive innovation.

scripts/alife-codeground-sensitivity.ts:43-73; src/sim/entities.ts:1161

Ecology

Repository documents edible flora, grazing/waste/fertilizer feedback, predation, weather and a sanctuary. The refuge test uses four comparison arms and a direct immunity ablation, while holding the sanctuary percept coupling.

A modeled food web with authored rules, not real-world ecological fidelity or verified autonomous plant-genome coevolution. Numerical population outcomes in comments were not rerun. The scoring-script prose describing withholding safeZoneAt is stale relative to the stronger current immunity ablation test.

docs/reports/README.md:18-26; tests/xenomimics-ecology.test.ts:225-278; scripts/alife-codeground-sensitivity.ts:74-92

Morphology and physics

Docs describe Gray-Scott reaction-diffusion, state-driven geometry and shaders, and soft plant interaction.

Reactive morphology is not equivalent to evolution of articulated body plans in a physics simulator such as Sims or Framsticks. No benchmarked morphology superiority established.

scripts/alife-codeground-sensitivity.ts:93-98

Cognition and learning

The repository contains bounded numerical policies, prediction-error control, chemotaxis, parameter-shift VQE drive resolution and predictive-metacognition modules with focused ablation tests. Xylos adds recurrent numerical sensing and action.

These are different mechanisms, not a calibrated intelligence scale. Later V4 and Phase-B reports retain failed controls and forbid broad intelligence/learning/scaling uplift.

scripts/alife-codeground-sensitivity.ts:99-114; src/sim/xenomimic-brain.ts:11-25; src/sim/xylos-mind.ts:1-28; tests/flora-chemotaxis.test.ts:138; tests/vqe-drive-resolver.test.ts:51; tests/predictive-metacognition.test.ts:26

Negative-results boundary

Current canonical docs retain V4 failures for ordinary organisms, predictor and Petri; Titans pass only bounded game-policy semantic causality. Phase-B V3 predictor fails all advancement criteria; narrow NHI action diagnostics do not authorize adaptation or broad learning claims.

Repository-reported experimental receipts; not rerun or independently replicated in this audit.

README.md:54-73; docs/reports/README.md:46-64; docs/VERIFICATION-ANALYTICAL-DATA.md:91-121

Quantum and substrates

Xenomimic source contains classical numerical statevectors and a numerical position-space Schrodinger solver; wavepacket spread changes a control signal.

No physical QPU, quantum hardware advantage, physical quantum entropy, or quantum consciousness demonstrated. Multiple simulated model families share classical digital hardware. A count of consumers or numerical formalisms is not physical substrate diversity; rename this axis to model/integration diversity if retained.

`src/sim/xenomimic-brain.ts:2,13-38,462-500; scripts/alife-codeground-sensitivity.ts:115-126`

Instrumentation

A dedicated seeded mulberry32 sample is passed through a statistical randomness battery; it does not tap or perturb live draws. Source exposes sample count, entropy, serial correlation and monobit statistic.

Statistical diagnostics on a pseudorandom generator do not certify cryptographic randomness or physical entropy. Test count/coverage are repository receipts, not scientific validity.

`src/core/rng-provenance.ts:4-15,20-61`

Consciousness

Kernel snapshots explicitly carry indicatorOnly. Canonical docs say 8/14 met plus 6/14 partial, and report weak coupling and a near-zero lab null gap.

The 8+6 result is a project-specific architectural assessment, not external certification or proof of consciousness. Xylos has a separate research-target table; apex assessment does not transfer.

`src/sim/consciousness-kernel.ts:28-32; docs/VERIFICATION-ANALYTICAL-DATA.md:40,86,359-360`

Xylos update

Xylos is a compact recurrent autonomous numeric organism with chemistry sensing, plastic coupling, visible neural state and bounded local input recording/replay. Live mode injects browser entropy; seeded mode is reproducible.

Replay reconstructs the brain input trajectory, not whole-world rollback. Live entropy cannot be regenerated from seed alone. No tokens/network inference required. No consciousness, general intelligence or open-ended biological evolution established.

`docs/XYLOS.md:3-41,77-103; src/sim/xylos-mind.ts:1-28`

Scale and maturity

README describes 10k default population and 50k explicit stress ceiling; current metadata version is 0.23.0 and canonical tracked-suite receipt is 3381.

The scoring script records roughly 167 ms/frame for a historical 50k benchmark; do not market 50k as demonstrated smooth interactive performance. Suite not run in this audit; no independent replication evidence located.

`README.md:31-32,793-811; scripts/alife-codeground-sensitivity.ts:144-149; docs/VERIFICATION-ANALYTICAL-DATA.md:31`

10 Follow-up tracker

State	Area	Record / next action
Completed	PDF structure	Counted all 140 labels and confirmed ten names repeated fourteen times.
Completed	CSV integrity	Parsed 129 rows and matched current repository CSV; retained original data separately.
Completed	128 external input entries	Checked identity, category, core description and citation to the stated evidence level.
Completed	Expansion	Added 25 separately sourced entries; all have scope notes.
Completed	Publication correction	Merged one redundant entry, separated glossary and unresolved entries, and retired the unsupported headline ranking.
Partial	18 catalog entries	Limited primary extraction or incomplete source access remains; see verification notes.
Pending	3DVCE	Recover original project documentation supporting the detailed technical claims.
Pending	Evosphere PDF identity	Identify the intended author/repository before counting the PDF-only label.
Pending	CQM runtime verification	Rerun targeted controls and full suite on a pinned accessible checkout; this audit inspected source only.
Pending	Independent comparison	Run matched benchmarks and seek independent replication before publishing superiority claims.
Pending	Repository documentation repair	Apply the listed arithmetic/prose corrections in a dedicated repository change; this task produced corrected deliverables without editing the repository.

The corrected report and data are ready to use as an honest landscape. Pending items are explicit research and provenance limitations, not hidden completion claims.