Simulation Is Not Genesis

Why an Increasingly Accurate Map of the Brain Is Not Yet a Construction Plan for Consciousness

Abstract

The traditional comparison between biological brains and artificial systems is becoming increasingly difficult to sustain in terms of individual properties. Artificial networks can exhibit recurrence, plasticity, critical or near critical dynamics, metastable behavior, high dimensional population activity, adaptive responses, and large scale connectivity. Whole brain simulations have reached tens of billions of neurons, while digital twin approaches can assimilate electrophysiological data from living brains and reproduce aspects of their changing dynamical states. Many properties once invoked to distinguish biological cognition from artificial systems can therefore already be reproduced, at least in partial or abstract form.

This article argues that the decisive distinction lies elsewhere. Contemporary neuroscience increasingly describes the brain as a continuously active, plastic, context dependent dynamical system whose present organization reflects phylogenetic history, ontogenetic development, and lifelong plasticity. Simulation can reproduce increasingly detailed relations found in this organization. Yet these relations constitute a map of an already developed system. They do not thereby provide the developmental process through which that organization came into existence.

The distinction is captured by separating simulation, reconstruction, and genesis. Simulation reproduces selected relations of an existing system. Reconstruction would reproduce the organization required to generate the relevant phenomenon. Genesis is the historical process through which that organization itself emerged. These are not stages on a continuum of increasing fidelity. Simulation and reconstruction begin from something already identified; genesis is the process through which what can later be identified first comes into existence. A complete record of developmental states would therefore still be retrospective. More importantly, even a complete record could not turn the reproduction of a known developmental sequence into the genesis through which that sequence originally became possible. Reproduction begins from an already identified result or path. Genesis does not. Its successive states participate in generating the conditions of their own continuation. The distinction is therefore not merely epistemic but categorical: increasing fidelity of reproduction does not gradually become genesis.

This distinction does not imply that only biological material could ever support consciousness. Nor does it exclude the possibility that an artificial or synthetic intervention might initiate the conditions for an open developmental history of its own. But if such a process genuinely generated its own subsequent possibilities, it would constitute a new genesis rather than the reconstruction of consciousness from a map of a mature brain. Conversely, insofar as the process remained specified by a model of the known biological path, it would remain reproduction. The argument therefore targets a specific but influential assumption: that increasingly complete reverse engineering of the present brain will eventually become a construction plan for consciousness.

1. The Problem Has Changed

Arguments about artificial consciousness have often proceeded by identifying some property supposedly possessed by biological brains but absent from machines. The missing property has

variously been said to be recurrence, integration, global availability, embodiment, plasticity, nonlinear dynamics, biological complexity, or some special pattern of connectivity.

This strategy is becoming increasingly difficult to maintain.

Artificial recurrent networks generate autonomous dynamics. Spiking neural networks can produce avalanche like activity and operate near critical regimes. Neuromorphic architectures implement local plasticity and adaptive dynamics. Large scale computational models reproduce aspects of resting state activity. Digital twins can assimilate measurements from living nervous systems. Artificial agents can develop sensorimotor histories in complex environments.

The point is not that artificial systems have already reproduced biological brains in full. They clearly have not. The important fact is that many candidate distinguishing properties can be instantiated independently.

That changes the philosophical problem. If each property can in principle be reproduced, then the difference between a conscious biological system and an artificial system cannot simply be identified with one item on a list.

The more successful simulation becomes, the more clearly the question shifts from individual properties to their organization and from organization to genesis.

This article begins from that shift.

2. What Neuroscience Is Actually Finding

The contemporary brain is increasingly difficult to describe as a collection of fixed functional modules waiting to respond to inputs. Even in the absence of an explicit task, neural activity is continuously evolving. Resting state activity contains structured fluctuations across multiple temporal and spatial scales, and these ongoing dynamics influence the response to subsequent perturbations.

The critical brain hypothesis provides one important example. Hengen and Shew recently reviewed two decades of experimental work and analyzed 140 datasets published between 2003 and 2024. They argue that criticality may represent a general functional setpoint toward which neural systems are regulated through mechanisms including homeostasis, plasticity, and development. Their claim remains part of an active scientific debate, but the relevant conception of brain function is already significant: the brain is treated as a dynamically regulated system rather than as a collection of independent processing units.

Recent experimental work also suggests that criticality is not simply a global state switched on or off uniformly across the brain. Liu, Fei, and Liu found resting activity to be near critical across cortical subsystems, while perceptual tasks selectively shifted task engaged subsystems closer to criticality. Cognitive activity, on this picture, involves local modulation of an already active dynamical organization rather than activation of an otherwise inactive module.

The relationship between criticality and consciousness is also informative. Maschke and colleagues examined spontaneous EEG activity under propofol, xenon, and ketamine anesthesia. States associated with unconsciousness showed movement away from criticality related measures, whereas ketamine, under which vivid conscious experience may persist despite behavioral unresponsiveness, produced a different pattern. The same spontaneous EEG dynamics also predicted individual Perturbational Complexity Index values.

This does not establish that criticality is consciousness. It shows something more relevant here: the effect of a perturbation depends on the dynamical organization already present before the perturbation occurs.

A stimulus does not enter an empty apparatus. It encounters a system that is already in motion.

3. Stability Without Fixity

The same picture emerges from other areas of systems neuroscience.

EEG microstates are large scale topographical configurations that persist for only approximately 50 to 120 milliseconds before transitioning to different configurations. Recent reviews emphasize both their relevance to large scale brain organization and the danger of assigning overly simple fixed psychological functions to individual microstates.

Research on metastability points in a related direction. Neural systems can transiently form coordinated configurations without becoming permanently locked into them. A 2025 review found substantial variation in how metastability is operationalized across empirical studies, but the underlying research program is built around a common problem: how the brain maintains coordinated organization while remaining capable of rapid transitions into different states.

This can be called dynamic stability. The brain remains a functioning system not because every relation remains fixed, but because coordinated organization persists through continuous change.

The subjective stability of consciousness need therefore not correspond to neurophysiological stasis. A conscious organism can remain globally conscious while contents, attention, large scale coupling, and population configurations change continuously.

The contrast with the traditional machine metaphor is important. A conventional technical machine is usually understood in terms of components whose identities and functional roles remain sufficiently stable for the machine to be decomposed, analyzed, reconstructed, and operated according to a fixed design.

The nervous system does not fit this picture straightforwardly.

4. Population Dynamics Instead of Isolated Functions

The shift is equally visible in neural population research. Neural manifold approaches describe the coordinated activity of large populations as trajectories within structured lower dimensional spaces. These manifolds reflect constraints imposed by connectivity, task, behavior, and network organization.

Perich, Narain, and Gallego describe neural manifolds as mathematical descriptions of possible collective states of neuronal populations under intrinsic and extrinsic constraints. Their relevance lies precisely in moving the explanatory focus away from individual neurons considered independently.

Oby and colleagues provide an experimental illustration. Using a brain computer interface, they challenged monkeys to produce neural population trajectories that violated naturally occurring temporal dynamics, including time reversed versions of normal activity trajectories. The animals were

unable simply to generate arbitrary trajectories, suggesting that population activity is constrained by underlying network organization.

This does not mean that individual neurons, regions, or pathways become scientifically irrelevant. Lesions, stimulation, electrophysiology, and molecular manipulation continue to reveal genuine causal contributions.

The important distinction is more modest. Scientific decomposition is a method for gaining access to the system. It should not automatically be identified with the complete causal organization of the system itself.

When researchers describe a sequence of processes as A causing B and B causing C, they have isolated variables that permit investigation. The success of that analysis does not by itself demonstrate that A, B, and C possess context independent functional identities throughout the organism's history.

The decomposition may be scientifically necessary without being ontologically exhaustive.

5. Context Dependence Is Not an Exception

This problem has been discussed explicitly within cognitive neuroscience. De Wit and Matheson examine attempts to map capacities at the organism level through computational descriptions onto specific neural mechanisms. They emphasize neural reuse, degeneracy, plasticity, and context sensitive organization as reasons why simple one to one mappings are often inadequate.

A brain region may participate in different functional configurations depending on task, previous activity, global state, and behavioral context. Conversely, similar behavioral outcomes can sometimes be supported through different neural configurations.

This is not evidence that neuroscience cannot discover causality. It means that causal contribution and fixed functional identity should not be equated.

The same anatomical structure can acquire different causal significance within different system states.

This matters for artificial simulation because the more context dependent biological function becomes, the less convincing it is to assume that a list of individually reproduced mechanisms automatically reproduces the organization within which those mechanisms have their biological roles.

The map can contain every identified component while still leaving open how those components became parts of this particular system.

6. Simulation Has Become Remarkably Powerful

At this point the comparison with artificial systems becomes especially interesting.

The Digital Brain platform reported by Lu and colleagues implemented large scale spiking neural networks with up to 86 billion neurons and approximately 47.8 trillion synapses distributed across 14,012 GPUs. The system reproduced aspects of human resting state BOLD activity and interacted with perceptual input in a visual task.

This is not a toy model in the ordinary sense. Numerical scale itself is no longer a sufficient argument against simulation.

Digital twin approaches move in another direction. Takahashi and colleagues developed a recurrent neural simulator that assimilated electrocorticographic data from macaques in awake and anesthetized states. The model updated latent states in real time, reproduced aspects of measured neural dynamics, and supported virtual interventions corresponding to changes associated with anesthesia.

Artificial systems can also implement plasticity, self regulation, recurrent activity, adaptive trajectories, and critical like dynamics. None of these achievements establishes consciousness, but that is exactly the point.

The comparison increasingly reveals overlap at the level of measurable dynamical properties.

We should therefore resist an easy argument in either direction. The fact that artificial systems reproduce these properties does not prove artificial consciousness. Equally, the fact that the properties were first discovered in biology does not show that they are biologically exclusive.

The empirical frontier is moving.

Any philosophical argument that depends on one supposedly unreproducible neural feature is therefore vulnerable to technological progress.

7. What Simulation Actually Gives Us

The success of simulation allows the question to be stated more precisely.

A model is built by identifying variables and relations in an existing system. It may reproduce activity statistics, connectivity patterns, dynamical responses, trajectories, perturbational behavior, or behavioral output.

As the model improves, the correspondence can become extraordinarily detailed.

Yet all such success concerns relations identified in a system that already exists.

The model starts from the result.

This is not a criticism. It is the scientific purpose of modeling. A model abstracts from an existing phenomenon in order to reproduce, predict, or explain selected aspects of it.

The philosophical mistake begins only when improved correspondence is treated as though it automatically reversed the historical process that generated the system being modeled.

A digital twin can become an increasingly accurate map of the current brain without thereby becoming the developmental history of that brain.

A whole brain simulation can reproduce aspects of present dynamics without reproducing the history through which the biological system acquired the constraints that make those dynamics possible.

This is the distinction between map and genesis.

8. The Map Can Become Arbitrarily Good

The phrase "map" should not be misunderstood as implying that simulations are crude or superficial.

A map can become extraordinarily precise.

It can contain microscopic structure, temporal relations, nonlinear dependencies, probabilistic transitions, multiscale interactions, and responses to perturbation. In principle, one can imagine progressively richer descriptions approaching every measurable property of the present system.

Nothing in the present argument depends on simulations remaining simple.

The problem is different.

A complete description of what exists now is not automatically a specification of how it came to exist.

This distinction can be obscured because technical artifacts often behave differently.

If we analyze a bridge thoroughly enough, we can recover much of what is required to build another bridge with the same design. The relevant materials, geometries, loads, and relations can be specified independently of the accidental details of the first bridge's history.

For the purposes that define the artifact, the map can become a blueprint.

That inference cannot simply be transferred to biological organization.

9. Why the Bridge Analogy Matters

A bridge illustrates what targeted engineering normally presupposes.

The materials and component relations are sufficiently stable that the design can precede construction. Steel does not alter the definition of steel because one section of the bridge was assembled earlier. A support does not normally modify the space of possible future supports merely by being installed.

Construction takes place within a sufficiently stable framework of elements and relations.

A living organism develops differently.

The organism produced at one moment becomes part of the conditions under which later development occurs. Neural activity changes synapses. Experience changes subsequent responsiveness. Learning changes the conditions of later learning. Bodily growth changes sensorimotor coupling. Maturation alters plasticity. Hormonal, metabolic, and environmental histories modify later dynamics.

The structure being built participates in changing the conditions of its own further construction.

This does not mean that biological development is unconstrained. It is highly constrained. Genes, cellular architecture, developmental mechanisms, physical laws, and species specific organization matter enormously.

The point is that the mature organism is not assembled from independently stable components according to a complete prior plan in the same sense as the bridge.

Its present organization is a historical achievement.

10. Three Histories Converge in the Present Brain

It is useful to distinguish three forms of history without confusing them.

Phylogenetic history produced the organismic architecture within which human neural development becomes possible. Evolution shaped cell types, developmental programs, body plans, sensory systems, metabolic organization, and nervous systems.

Ontogenetic development produces the individual organism. Embryogenesis, neural differentiation, migration, synaptogenesis, pruning, myelination, spontaneous activity, sensory experience, and bodily interaction progressively form the individual nervous system.

Lifelong plasticity continues to modify that system. Learning, memory, injury, aging, homeostatic regulation, repeated activity, and environmental history leave traces in current organization.

The adult brain is therefore not simply an implementation of a timeless neural design.

It is the current condensation of multiple histories.

The evolutionary claim can be stronger than the ontogenetic one. Longo, Montévil, and Kauffman have argued that evolution does not merely traverse a completely predefined phase space but contributes to generating new biological possibilities. That stronger thesis need not be assumed for individual development.

For the present argument, a more modest claim is enough: the current brain does not uniquely specify the concrete history that generated it.

11. A Developmental Record Is Still Retrospective

One could answer that this difficulty is merely technological. Perhaps future science will monitor an organism continuously from conception to adulthood. Every neural state, every molecular change, every interaction, and every environmental influence might someday be recorded.

Would that not give us the missing developmental map?

It would give us an extraordinarily detailed developmental record.

That is not obviously the same thing as a construction plan.

A record tells us what occurred in one historical trajectory. It shows which states followed which states under the conditions actually encountered by that organism.

A construction plan does something different. It specifies conditions and operations that can be used prospectively to generate the desired result.

The difference matters because each observed developmental state participated causally in producing the conditions of the next state. Simply replaying a sequence of measurements is not equivalent to reproducing those generative relations.

A complete film of a bridge being built can be interpreted against an independently specifiable engineering design.

A complete film of an organism developing does not automatically become the program from which the organism can be regenerated.

The strongest point of the argument is therefore not that the past is unobservable.

It is that retrospective description and prospective generation are different epistemic achievements.

12. The Organism Is Part of the Explanation

The developmental issue also explains why the brain cannot simply be abstracted from the organism as though its biological context were an incidental container.

Neural activity depends on continuously maintained biological conditions. Ion gradients, cellular metabolism, synaptic turnover, vascular supply, glial regulation, endocrine processes, immune processes, and bodily homeostasis contribute to the conditions under which neural dynamics exist.

The classic concept of autopoiesis attempted to capture this form of circular organization: the processes of the living system produce and maintain components that in turn sustain the organization through which those processes continue. Varela, Maturana, and Uribe formulated this as an organizational characteristic of living systems, while later approaches such as Montévil and Mossio describe biological organization through mutually dependent constraints.

This does not imply that carbon chemistry is metaphysically privileged.

The relevant contrast is not simply biology versus silicon.

The stronger question is whether the artificial system instantiates a comparable self maintaining organization and, crucially, whether its present organization was generated through its own history rather than merely specified from outside as a set of copied functions.

The distinction remains one between reproducing a map and generating an organization.

13. What About Artificial Development?

A sophisticated objection follows immediately.

Suppose an artificial agent is not constructed as a static architecture. Instead, it is placed in a simulated or physical environment and allowed to develop over millions of interactions. It learns, rewires, changes its own behavior, modifies its internal organization, and acquires an individual history.

Would that not amount to genesis?

Potentially, yes.

This is precisely where the argument must avoid overstatement.

The mere fact that the environment is simulated does not decide the issue. Nor does the fact that the substrate is artificial.

The relevant distinction concerns the role of the history itself.

If the agent simply explores states within an architecture whose relevant possibilities and transition rules were externally fixed, then it possesses a history, but that history remains development within a designer supplied framework.

If, however, the system progressively generates and maintains the constraints that shape its own future organization, then the conceptual situation changes. Such a system would be acquiring a developmental history of its own.

At that point it would no longer be accurate to describe what is happening merely as reconstruction of a mature biological system from a neuroscientific map.

A new genesis would have begun.

This possibility does not undermine the map versus genesis distinction.

It confirms it.

14. Synthetic Biology Makes the Distinction Clear

Synthetic biology provides the clearest material version of the same point.

Suppose researchers eventually succeed in constructing a minimal self maintaining system from nonliving components. Suppose that system reproduces, evolves, develops new forms of organization, and over a long history eventually produces something resembling a nervous system.

That would be a profound scientific achievement.

But it would not show that researchers had obtained the developmental history of an existing organism by analyzing its adult state.

They would have established conditions under which a new biological history could unfold.

The difference resembles the distinction between copying a mature tree atom by atom and planting a seed from which another tree develops. The resulting organisms may resemble one another, but the explanatory routes are different.

Synthetic biology therefore suggests a possible route around reverse engineering, but it does so precisely by initiating genesis rather than extracting genesis from a static map.

This limits the claim of the present article in an important way.

The argument is not that no artificial intervention could ever lead to consciousness.

The argument is that reverse engineering the present organization of a conscious brain does not by itself provide the developmental process required to generate that organization.

15. Why This Matters for Consciousness

The discussion so far concerns biological organization generally. One further premise is required before drawing conclusions about consciousness.

Path dependence alone does not produce phenomenal experience. Many physical and artificial systems have histories without being conscious.

The relevant premise is that consciousness depends constitutively on the organization generated within a living, self maintaining nervous system rather than merely on a snapshot of abstract functional relations.

On this view, states acquire significance for the organism within an organization that maintains its own continued existence. Neural events do not merely transform information. They occur within a system for which changes can have consequences for its own organization, regulation, and continued existence.

This is where the argument connects genesis to phenomenal consciousness.

If that premise is wrong, then the developmental argument will not establish a limitation on artificial consciousness. A sufficiently strong functionalist could maintain that only the final causal organization matters and that any history producing the same organization is irrelevant.

But that position cannot be assumed as the default conclusion of simulation.

It is precisely one of the philosophical questions at stake.

An increasingly faithful simulation demonstrates increasing functional and dynamical equivalence relative to the variables being simulated. It does not independently establish that those variables exhaust the conditions of phenomenal consciousness.

16. Simulation, Reconstruction, and Genesis

The central conceptual distinction can now be stated without mathematical formalization.

Simulation reproduces selected relations or behaviors of an existing system.

Reconstruction reproduces the organization required to generate the phenomenon under investigation.

Genesis is the history through which that organization itself comes into existence.

These are not stages on a continuum of increasing fidelity. They may occur within the same scientific project, but they must not be collapsed into one another.

Simulation and reconstruction begin from something already known or identified. Their target is given in advance as a structure, relation, capacity, or developmental sequence to be realized. They can become progressively more complete without thereby approaching genesis.

Genesis has a different logical form. Its result is not given in advance as the target of the process. Previous states contribute to producing the conditions under which later states become possible. In living development, the process therefore participates in generating its own space of subsequent possibilities.

A complete simulation of the present brain, or even a technically exact reproduction of an identified developmental sequence, would remain a reproduction of what has already become known. Increasing fidelity does not transform reproduction into the original genesis. Similarity of properties is not continuity of genesis.

Conversely, a genuinely autonomous synthetic or artificial developmental process could constitute a new genesis. If it progressively generated and maintained the constraints shaping its own future

organization, the relevant achievement would no longer be the reconstruction of the original biological history. A new history would be unfolding.

The question is therefore no longer simply whether a machine can reproduce the functions of a brain. It is whether the organization relevant to consciousness is exhausted by reproducible present functions, or whether its historical generation is constitutive of what that organization is.

17. The Consequence for Functionalism

Strong functionalism tends to abstract from developmental history. If two systems instantiate the same relevant causal or functional organization, differences in substrate or history are regarded as irrelevant.

This is a powerful abstraction in engineering.

A calculator can be built through different manufacturing processes without changing the computation it performs. A bridge can be rebuilt from a stable design without reproducing the microscopic history of the original bridge.

Biological cognition may be different because the current role of a component can depend on how that component became integrated into the larger system.

The same present function does not automatically establish the same developmental organization.

This does not refute functional description. Functional analysis remains indispensable.

It does place a burden on the stronger metaphysical inference from functional equivalence to phenomenal equivalence.

If consciousness depends on historically generated organismic organization, then reproducing the input output and internal functional structure visible in the present system may still omit something constitutive.

The present argument therefore does not show that functionalism is false.

It shows why simulation cannot simply presuppose its truth.

18. Could Consciousness Appear by Accident?

One final possibility remains.

Engineers might combine recurrent dynamics, plasticity, embodiment, criticality, self regulation, and adaptive learning without knowing whether the resulting system will be conscious. Perhaps consciousness nevertheless appears.

The developmental argument cannot logically exclude such an event.

But its epistemic status would be different from deliberate construction based on an explanatory theory.

Researchers would have discovered that some set of conditions was sufficient, assuming there were a way to establish that consciousness had actually occurred. Only afterward could they attempt to identify which generative relations were responsible.

Unexpected occurrence and controlled construction are not the same achievement.

Scientific discovery often begins with unexpected phenomena. Once the relevant conditions are understood and reproducible, the phenomenon can become the object of deliberate engineering.

Artificial consciousness could in principle follow such a route.

But in that case consciousness would not have been derived from the map of the present biological brain.

The generative principle would have been discovered experimentally through a new process.

Chance is not a construction principle.

19. What the Argument Does and Does Not Establish

The argument should therefore be stated at the right level.

It does not prove that consciousness could never occur in any artificial substrate.

It does not prove that every detail of a biological organism's history must be reproduced.

It does not prove that synthetic biology could never generate a conscious system.

It does not depend on the claim that silicon is incapable of experience.

Its target is narrower and more defensible.

Increasingly complete reverse engineering of the present brain does not become a construction plan for its genesis. The reason is not merely that the adult neural organization being modeled is the result of a history we do not yet know in sufficient detail. Even a complete retrospective description would remain a description of what has already occurred; using it prospectively would reproduce an identified path rather than recreate the open genesis through which that path first became possible.

A current state can therefore be mapped with extraordinary precision, and a known developmental sequence can in principle be reproduced with increasing fidelity, without reproduction thereby becoming genesis.

If the organization relevant to consciousness is historically constituted, this categorical distinction becomes philosophically decisive.

The stronger impossibility question must be addressed elsewhere by arguing that the relevant form of self maintaining biological genesis is itself indispensable for consciousness.

The present article supplies a different result.

It shows why successful simulation cannot by itself settle that question.

20. Conclusion

The progress of neuroscience and simulation has changed the debate about artificial consciousness.

Neuroscience increasingly describes the conscious brain as a continuously active, plastic, dynamically regulated system. Criticality research emphasizes multiscale dynamics and homeostatic regulation. Perturbational studies show that responses depend on ongoing global organization. EEG microstates

and metastability reveal rapid reconfiguration beneath apparent stability. Neural manifold research describes cognition in terms of constrained population trajectories rather than isolated functional units.

At the same time, artificial systems increasingly reproduce these very properties. Whole brain simulations operate at unprecedented numerical scales. Digital twins reproduce aspects of measured neural trajectories. Artificial networks display recurrence, plasticity, critical like dynamics, metastability, and adaptive behavior.

This convergence is important.

It means that the difference between biological consciousness and artificial systems cannot safely be located in any one of these features.

Yet the success of simulation does not eliminate the distinction between present organization, reproduction, and genesis.

A simulation begins from relations that science has identified in an already existing system. It can reproduce those relations with increasing precision. A reconstruction can go further and reproduce an identified organization or developmental sequence. Both begin from something already known. They can become extraordinarily accurate maps without thereby becoming genesis.

But the brain represented by that map did not appear as a finished architecture.

It became what it is.

Phylogenetic history generated the organismic framework. Ontogenetic development generated the individual nervous system. Lifelong plasticity continues to modify its organization. Body, environment, activity, and biological self maintenance participate in this history.

A complete record of those changes would still describe a history that has already occurred. Even if every relevant stage were known, using that record as a prospective construction plan would reproduce an identified sequence. It would not turn reproduction into the open genesis through which those possibilities originally arose.

For technical artifacts such as bridges, this distinction is usually irrelevant because the identities and relations required for construction are sufficiently stable for a plan to specify the artifact in advance.

For living systems, earlier organization contributes to changing the conditions of later organization. The process participates in producing its own subsequent possibility space.

That is why the map of the present is not automatically a map of genesis, and why an increasingly faithful reproduction of biological properties does not gradually become biological genesis.

Artificial systems may eventually develop histories of their own. Synthetic biology may initiate new forms of autonomous organization. A future artificial system might even become conscious through such a process.

If so, that achievement would not show that consciousness had been extracted from a static map of the adult brain or reproduced by accumulating biological properties.

It would show that a new genesis had begun.

Simulation can reproduce the map.

Reconstruction can reproduce what the map identifies.

Genesis produces the landscape from which the map can later be drawn.

Confusing these processes is the mistake. Similarity of properties is not continuity of genesis.

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