

UNITED WISDOM

Emergence: where do a whole’s new properties come from?

World and Consciousness

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Epigraph

> *Problem solving requires selective trial and error.*

Herbert A. Simon, The Architecture of Complexity, 1962, problem-solving section, p. 473. Complete original English sentence. Its context concerns selecting possibilities during a search; it establishes no universal psychological law.

What this article is about

A single letter has no sentence’s meaning, and one node does not possess all the routes available in a network. Examples like these introduce emergence: where do characteristics that require a description of the whole come from? Yet a striking term supplies no mechanism. A new property may depend on relations between parts, a way of observing them, a chosen scale or the history of a structure’s formation. These possibilities require different checks.

This article compares Philip Anderson’s argument about scientific levels, Alan Turing’s bounded chemical model and Herbert Simon’s account of complex organisation. They provide no joint proof about consciousness or spirituality. Original elementary examples show when an additional characteristic follows from specified rules and when information remains missing. For United Wisdom, the practical question is what we want to understand: composition, relations, a result’s development, a feasible prediction or its meaning for people. That distinction determines which reasons to seek and which conclusions to leave open.

I. What has appeared at the level of the whole?

Begin by naming the property. Saying that a system has become different leaves too much unspecified: its size, connections, stability, accessible routes or our classification may have changed. Each characteristic should answer a question. Placing three objects together increases their total number; connecting them changes their possible interactions. This distinction requires no mysterious addition to matter. It requires including relations. Once the property is explicit, we can ask whether a part possesses it, whether parts and connections jointly determine it, or whether it depends on the observer and the purpose of the description.

Consider an original teaching example with three nodes, A, B and C. The first diagram connects A to B and B to C; the second adds a connection from C to A. Both contain three

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nodes, but only the second contains a closed route. Here a route cannot reuse a connection: returning along the line just traversed does not count as a cycle. No individual node possesses that route. Nevertheless, the property follows from the stated connections: follow them and return to the starting point. This modest example shows a relational property. It proves nothing about whether an organism's properties are fundamentally underivable. Even here, the assumptions matter: connections are two-way, and the other rules stay the same.

Now ask how many nodes remain reachable after one connection is removed. Removing either connection in the chain splits the diagram. In the triangle, removing any one of its three connections leaves every node connected through another route. This is resilience to a particular kind of damage. It cannot be assigned to one node, but checking three possibilities establishes it. It says nothing about material strength, transmission speed or repair costs. Without those qualifications, resilience promises more than the example shows. A real network would require checking which connections exist and what kind of damage the question concerns.

In The Architecture of Complexity, Simon describes systems through interacting subsystems. His account supplies a useful requirement: divisions should reflect connections, rather than merely objects' positions in a picture. Anderson's More Is Different asks a different question: whether knowledge of fundamental rules suffices to reconstruct complex behaviour. Our three-node example does not answer that question for physics. It clarifies an earlier step. Comparing isolated parts with a whole while excluding relations from the first description makes the comparison incomplete. Some apparently unexplained novelty may arise from that omission, which should be examined before a larger conclusion is drawn.

II. Reduction and reconstruction of behaviour

Anderson does not begin by rejecting common physical laws. He distinguishes accepting laws governing components from being able to reconstruct a complex whole's behaviour from that knowledge. Reconstruction requires accounting for many particles, their organisation and the conditions. Accepting the first position does not automatically accomplish the second task. "Everything consists of particles" may be true in its intended sense and still leave a question about structure, transition or observable behaviour unanswered. Intermediate work is needed: identify states, interactions, scale and suitable ways of describing the outcome. A statement about ingredients is not yet that work.

A descriptive level is selected for a task. Establishing an object's composition calls for one set of characteristics; asking whether a construction withstands a specified load requires more than composition alone. Arrangement and conditions of use also matter. This is an original illustration of different questions, not an engineering calculation. It shows why calling something material does not explain its particular behaviour. However, changing vocabularies

gives no permission to introduce unestablished causes. A new variable needs a connection with observation, calculation or an explicitly identified hypothesis. Otherwise a descriptive level becomes a convenient shelter for claims that cannot be assessed.

Early in his article, Anderson stresses the need for new concepts at different stages of scientific investigation. His short clause about psychology and biology belongs to that argument. It does not mean that a psychological event is independent of bodily conditions or that biological evidence is irrelevant. Still less does it prescribe help for a particular person. A distinct research question can coexist with dependence on other levels. Preserve both points: causes may connect while useful explanations differ in object and scale. Different vocabularies do not invariably imply different fundamental laws of nature, and separate questions do not erase their dependencies.

Ignorance must also be distinguished from a demonstrated impossibility. We may lack data, computational resources or a suitable theory. That does not establish that the behaviour cannot be derived in principle. The converse also fails: asserting derivability in principle supplies no completed calculation. Here emergence primarily names a question about organisation and explanatory levels. A strong metaphysical claim that properties fundamentally do not follow from physical conditions would need separate grounds. The historical works considered here do not let vivid examples or a calculation’s difficulty substitute for those grounds. Their questions remain valuable without that additional conclusion.

III. Conditions under which a pattern develops

In The Chemical Basis of Morphogenesis, Turing investigates how chemical processes and transport might participate in forming spatial patterns. From the beginning, the model has boundaries. Tissue has a specified geometry, and some mechanical changes lie outside the description. This is no complete explanation of an organism’s development. The choice makes a particular mechanism tractable while revealing the cost of simplification. Forgetting the boundary makes a mathematical possibility look like the established history of every living pattern. Between those claims lie tests of particular substances, conditions, measurements and the applicability of the selected approximations.

Section 4 raises an objection: how could a symmetrically arranged system produce an asymmetric outcome? Turing’s answer includes existing deviations and a selected instability. Small nonzero differences can grow under suitable conditions. The qualification matters: not every deviation grows, and not every system is unstable. Nor does diffusion alone explain the pattern. Reaction and transport act jointly in the account. The observed form belongs to the state of the connected system, although its description is built from specified processes involving components. Referring to the whole therefore need not introduce a separate force beyond those processes.

Turing’s two-cell example uses imaginary reactions chosen for explanatory convenience. That is a substantive feature. It shows a mechanism’s logical possibility without claiming that those reactions have been discovered in an organism. For emergence, the example is useful because its boundaries are visible: one can ask which connections and conditions make differentiation possible. It provides no current biological frequency, clinical forecast or proof of an additional organising power. Moving from this model to a particular living object would require evidence the teaching construction does not itself contain. Its transparency helps us see precisely where that further work begins.

Anderson separately distinguishes symmetry of physical laws from symmetry of a state. Rules can preserve a transformation that a particular state does not reproduce. Comparing his discussion with Turing’s helps show why a difference between result and rules is not automatically a violation of the rules. Their physical examples are not identical, and this article reproduces no mathematical proof of them. The comparison’s use is narrower: before calling a pattern unexplained, identify the object, initial conditions and transformation being compared. For human behaviour this is insufficient; its meaning and acceptability require grounds belonging to that domain.

IV. A division that assists explanation

Simon discusses nearly decomposable systems: interactions within selected parts may be stronger or faster than interactions between them. A part may then be treated relatively independently for some purposes, while exchange between parts matters for a longer process. This gives no permission to divide every whole in whatever way is convenient. Significant interactions and timescales must support the division. If information continually passes between nominal departments, an organisational label establishes no independence. That last example is an original analogy. Assessing an actual workplace requires observations, rather than importing a physical model because the vocabulary sounds similar.

Simon’s heat illustration involves rooms and a building with different rates of exchange. Changes within a room may converge faster than changes between rooms. At one scale, internal differences matter; at another, aggregate characteristics of the parts are useful. Omitting details from a concise description does not make those details cease to exist. Their influence is represented differently in the selected approximation. Isolation and exchange conditions remain essential. This historical illustration calculates no particular house’s energy consumption or safe thermal conditions. Those questions need other information and verification, rather than an unqualified extension of the example.

Simon’s watchmakers contrast two assembly procedures. In one, an interruption readily destroys the intermediate result; in the other, stable intermediate formations survive. Under the stated conditions, this changes the prospect of completing an assembly. The organisation of

the sequence matters alongside the list of identical components. Yet the constructed result is no universal law of evolution. Preserving an intermediate form establishes neither suitability for every environment nor a predetermined goal. To move from a simplified process to an actual history, one must show which intermediate states existed and why they survived. The illustration cannot supply those facts for us.

Comparing Simon with Turing clarifies different mechanisms. Preserving an assembled part and amplifying differences in a connected chemical system answer different questions. Organisation can be a convenient umbrella term, but it does not turn them into one cause. One account concerns a construction history, the other a state’s development under specified interactions. A substantive discussion of emergence should name what is missing: a stable intermediate stage, a connection, instability conditions or an appropriate observational scale. The term then helps locate the next question instead of hiding the mechanism behind a general description of novelty.

V. A property depends on the chosen description

Consider a second original example: two binary digits. There are four records, 00, 01, 10 and 11. We can describe each separately or group them by the parity of their sum. One group contains 00 and 11; the other contains 01 and 10. Knowing one digit does not determine the pair’s group. Knowing both does. The characteristic therefore does not belong to an individual digit, yet follows completely from the specified rule. This elementary construction lists its states explicitly. It proves nothing about whether every characteristic of a complex natural object is equally straightforward to derive.

Grouping also loses information. Being told only that the sum is even does not distinguish 00 from 11. The loss concerns the selected message, not disappearance of the initial state. This helps explain coarse descriptions: a useful characteristic can preserve what matters for a question and omit the rest. However, the grouping’s suitability needs grounds. If a subsequent process acts differently on 00 and 11, parity alone is insufficient for predicting it. Concision can help one task and obstruct another. Its usefulness does not automatically establish an independent law for the whole or a universally adequate level of description.

Another example rearranges the letters in stop and pots. The letters are the same, but order changes, and the records have different English meanings. Relations matter here alongside linguistic conventions and the context of reading. Meaning should not be declared merely a mechanical property of four letters. Nor does the example show a violation of the physical conditions of writing. Several descriptions are needed: material signs, sequence and use within language. The Russian version uses a corresponding Russian word rearrangement. Each language illustrates the same mechanism; the argument requires no identical inventory of letters across the two versions.

These constructions distinguish novelty for an observer, a new relational property and the appearance of new physical regularities. First noticing a closed route need not change the diagram. Adding a connection does change it. Choosing parity groups changes the description. None of these steps independently creates a new fundamental law. Anderson addresses more substantive physical levels, so elementary diagrams prepare the question rather than replace his argument. They help identify which meaning of new is being used and which check fits it. Otherwise a discussion may move between different claims while appearing to repeat a single word.

VI. Explanation, prediction and creation

Explaining an observed form, predicting a later outcome and creating a desired form are different tasks. An explanation may establish a significant connection and its conditions. Prediction needs sufficiently accurate data and a model of development. Creation requires available actions and resources. Success in one guarantees neither of the others. We may understand why a graph has an alternative route without being able to build a real network. An accurate account of an earlier event may leave tomorrow’s conditions unknown. Discussion of emergence becomes more precise when these tasks remain distinct and their requirements are named.

Anderson’s distinction between reduction and reconstruction is useful here. Knowing components’ rules does not provide a feasible procedure for obtaining every result. The obstacle may be computational, experimental or conceptual: perhaps the relevant variable has not been identified. These difficulties should be named separately. A missing procedure proves no additional force, while a principled outline is no completed forecast. Anderson concerns scientific investigation and new ways of understanding complex states. Specific present-day systems would need their own assessment of theory and data. His historical article cannot replace that work through the authority of its author’s name.

Simon’s search discussion emphasises selecting possibilities rather than indefinitely repeating random attempts. In a path-search example, information about a result can affect the next step. From that, we can frame an original everyday question: which information would change our next choice? We cannot attribute a universally validated recipe for learning or personal problem-solving to the source. Available options may be constrained by money, time, rules or other people’s consent. Another attempt is not equally available to everyone. A useful search diagram must therefore recognise the cost of a trial and the right to decline it.

Sometimes a small discriminating observation is sufficient. If we do not know whether the order of two operations affects a result, we can compare the order while holding other available conditions steady. Such comparison makes sense only when permissible and when the outcome can be observed honestly. Rearranging symbols gives no permission to

experiment with someone else's trust or safety. This is the boundary of the original UW proposal. It suggests clarifying a question and its conditions, promises no effectiveness and replaces no professional requirements. A legitimate result may be that a check is currently unavailable and the conclusion must remain limited.

VII. Human meaning does not follow from a diagram

Level readily acquires an evaluative meaning: one level starts seeming higher in worth than another. Physical and systems arguments establish no such conclusion. Descriptive scale and complexity of connections determine no person's value. A group gains no right to disregard a participant by calling itself a whole with new properties. This ethical boundary is UW's application and needs independent grounds: consent, rights, responsibilities and consequences. A systems description can help reveal a dependency. It does not decide what another person should endure for the sake of that dependency or authorise the diagram's maker to decide for them.

The appearance of a whole's property also proves no spiritual force. In the examples, specified relations, conditions or descriptive choices matter. A missing mechanism cannot be replaced by emergence and then treated as explained. A spiritual interpretation may hold personal meaning, but its status differs from a verified physical conclusion. Anderson qualifies transfers to culture; Turing studies a selected chemical model. Combining their sources into a narrative does not extend the reach of their demonstrations. An honest comparison preserves the distinction between arguments even when their questions enrich one another and suggest something worth investigating.

Everyday discussion benefits from separating observation and interpretation. Suppose decisions became faster after a meeting sequence changed. That observation alone does not identify the cause: the sequence, a different group of participants, prepared information or another condition may matter. Saying that the group acquired a new quality describes a result but removes none of these alternatives. A limited conclusion should name what changed and what remains unknown. Speed is also no independent measure of a good decision. Participants may value completeness, accessibility or fairness differently from the diagram's author, so their criteria belong in the question itself.

UW's original application therefore concerns disciplined questions. What property is assigned to the whole? Which parts and relations are included? At what scale is it observed? What supports the mechanism? Whose goals and constraints appear in the description? Answers need not form a complete theory. Their more modest role is to make a claim assessable and prevent a convenient name from standing in for a cause. Substantial uncertainty may call for a cautious action, further reading or withholding a conclusion. No physical term automatically selects among those choices, and the people concerned retain their own say.

VIII. Holding several explanations together

Several levels can describe one object without necessarily competing. Composition, relational structure and purpose answer different questions, but their claims should agree where they overlap. A claimed connection must be shown; if a purpose requires an accessible route, the diagram must actually allow it. When accounts conflict, seek the specific error instead of declaring a level inherently useless. Agreement requires no identical vocabulary. A word's meaning, the geometry of its signs and the material of its inscription remain distinct objects of inquiry. A particular written record connects them in one event without erasing those distinctions.

A short table can contain three columns: question, suitable description and missing evidence. For the three-node diagram, a question about a closed route needs the list of connections; a damage question needs specified removals. In a conversation, a similar table can organise known facts: who participated, what was proposed and what was agreed. It must not turn participants into nodes with predetermined wills. Revising a decision, declining or reporting a new circumstance belongs to the situation itself. Recognising that keeps the analogy limited and leaves room for a human response that the diagram cannot generate.

A completed explanation differs from a working direction. If relations are named but their production of the result is unshown, the mechanism remains proposed. If a result is reproduced only in a teaching construction, confirmation is limited to that construction. If a source considers a historical model, date and conditions matter. These distinctions permit reading Simon, Turing and Anderson together without producing a universal doctrine. Assembly, chemical development and physical levels support substantive comparisons. Differences between their mechanisms remain part of understanding, rather than an obstacle to a memorable unifying formula that claims more than the sources establish.

Emergence becomes a useful question when it leads to a more precise account. Sometimes we find a derivable relational property. Sometimes we need an aggregate description that loses information. Sometimes a serious reconstruction problem remains. Those results cannot be assigned one judgement in advance. A practical choice requires a further transition: what does knowledge permit us to do, at what cost, and who may decide? Physical explanation can improve understanding of conditions but assigns no personal meaning. Keeping that transition open connects decisions with reasons and available responsibility while preserving the limits of what has actually been established.

What this means in practice

Choose a small claim about a whole that you want to clarify, such as “this working sequence is more convenient”. State the observable difference. Convenience might mean less waiting, fewer omissions or more accessible participation; these criteria differ. There is no need to do the exercise if the question is currently irrelevant.

Name composition, relations and conditions separately. Mark what is directly known and what is assumed. Do not draw people as elements with predetermined motives. Where an action affects another participant, consent and the option to decline remain conditions of the situation.

Choose one discriminating observation available without risk or unnecessary commitments. It might compare permitted sequences of records or check a route in the teaching graph. Specify the boundary: the result concerns these conditions, rather than complex systems in general.

Afterward, record what changed in the explanation: a connection, an unsupported hypothesis or a new unknown. Neither a useful effect nor a life lesson is compulsory. If the convenience criterion itself changed, record that separately: a new question cannot confirm the earlier mechanism. Preserve the initial observation so the distinction remains visible. This original UW exercise clarifies questions; its effectiveness has not been studied here.

Key quotation

> *Psychology is not applied biology*

Philip W. Anderson, More Is Different, Science 177, 1972, p. 393. Complete grammatical clause excerpted from a sentence that continues by comparing biology and chemistry. No terminal punctuation has been added. The context concerns scientific concepts, not denial of bodily conditions or a psychological-care recommendation.

Connections between traditions

Question	Two primary anchors	Comparison and boundary
Parts and relations	Simon, pp. 467–468; Anderson, p. 393	Interactions supplement composition; subsystem descriptions prove no metaphysical underivability.
Mechanism and outcome	Turing, § 3, pp. 40–41; Anderson, p. 393	An outcome's label can omit significant steps; omission licenses no invented hidden cause.
Rule and state	Turing, § 4, pp. 42–44; Anderson, pp. 394–395	Symmetry of rules differs from symmetry of states; these models establish no complete biology.
Construction history	Simon, pp. 470–472; Anderson, p. 393	Stable intermediate forms affect assembly; the illustration is no law of purposeful evolution.
Approximation's cost	Simon, pp. 474–475; Turing, §§ 1, 3, pp. 37–41	Separated scales and fixed geometry simplify different tasks without making their mechanisms identical.
Analogy's boundary	Simon, pp. 467, 473; Anderson, p. 396	Analogy frames a question; the UW table and its ethical limits are original application.

Primary sources

Herbert A. Simon. The Architecture of Complexity. Proceedings of the American Philosophical Society 106, no. 6, 12 December 1962, pp. 467–482. Original English; text reproduction, institutional copy. The introduction and selected hierarchy, assembly, search and heat-example passages support the comparison. Constructed illustrations establish no universal biological or social laws.

Alan M. Turing. The Chemical Basis of Morphogenesis. Philosophical Transactions of the Royal Society of London, Series B 237, no. 641, 14 August 1952, pp. 37–72. Original English, institutional copy. The scope used is §§ 1–4, pp. 37–44: fixed geometry, chemical approximations and an imaginary two-cell example. A bounded model is not a complete theory of organism development.

Philip W. Anderson. More Is Different. Science 177, no. 4047, 4 August 1972, pp. 393–396. Original English, primary article reproduction. Reconstruction, descriptive levels and the

state/law distinction are considered. Cultural analogies retain their speculative status; a strong metaphysical thesis is not accepted here as established.

Tags

emergence, whole, parts, relations, descriptive levels, reduction, explanation, reconstruction, Anderson, Simon, Turing, systems, organisation, symmetry, state, model, approximation, structure, graph, parity, language, prediction, mechanism, analogy, limits, consent, responsibility, United Wisdom

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