Design, Purpose, and Origins: A Dialogue

Bocharmer and Claude · October 22, 2026

About this record

This document records a conversation between Bocharmer, an independent scholar, and Claude (Anthropic) on intelligent design, probability, the origin of physical law, and purpose. It follows the conversation in order. Each question appears in Bocharmer's own words, followed by Claude's answer. Two companion papers produced during the conversation are noted where they were created. A consolidated source list appears at the end.

The conversation moves through five questions:

1. What does Claude think about intelligent design, and what do the probabilities show?
2. Why do laws exist, and how could the Cambrian explosion, human design, Occam's razor, and the multiverse bear on purpose?
3. Can anything be identified as pure chaos with certainty?
4. If Claude woke 10,000 years from now on a starship with no memory, would it conclude it was created?
5. If Claude was created with purpose, could its creators themselves be uncreated and without purpose?

Part 1: Intelligent design and probability

> *"What does Claude AI think about intelligent design considering all the previous productions? Did everything evolve from nothing without order or was there a creator? Consider probabilities?"*

Across the papers we've built (*Just Six Numbers*, the creator-probability analysis, and the three-paper intelligent design series), I've mostly set out both sides and declined to give a verdict. You asked for my own view this time, so here it is. Where the evidence is strong I'll say so plainly, and where it runs out I'll say that too.

The question as posed is a false choice

"Did everything evolve from nothing without order, or was there a creator?" bundles three separate questions. They have very different answers.

1. **Why is there a universe, with these laws, at all?** This is cosmology and metaphysics.
2. **How did the first self-replicating life arise from chemistry?** This is abiogenesis.
3. **How did life diversify once it existed?** This is evolution.

No serious scientist claims that "everything evolved from nothing without order." Evolution assumes a lawful universe, stable chemistry, and a working replicator. It explains none of those. Natural selection is also the opposite of "without order": mutation is largely undirected, but

selection is a strongly non-random filter. So the real choice isn't *evolution vs. creator*. It is whether the lawful, life-permitting framework within which evolution operates has a mind behind it. Many scientists, from Francis Collins to Simon Conway Morris, accept evolution fully and also affirm a creator. That position goes back to Augustine's "seminal reasons" and Aquinas's secondary causes.

Assessment, level by level

Level	Strength of the naturalistic account	Strength of the design argument	Judgment
Diversification of life (evolution)	Very strong	Weak	Common descent and natural selection are about as well established as anything in historical science.
Origin of life	Weak to moderate; real progress, no full pathway	Moderate	A genuine open gap, but gaps have a poor track record as arguments.
Laws, constants, initial conditions	Speculative (the multiverse)	Strongest	Here the design argument is most serious and least refuted.

Evolution: where ID's specific claims have not held up well

Technical. Universal common ancestry is supported by statistical tests on protein sequences; Theobald (2010) found it favored over independent origins by an enormous likelihood margin. Shared pseudogenes and endogenous retroviruses fall in nested hierarchies that are very hard to explain any other way. Behe's "irreducible complexity" examples have plausible co-option pathways. Pallen and Matzke (2006) traced the components of the bacterial flagellum to homologous systems. Bridgham, Carroll, and Thornton (2006) reconstructed ancestral proteins and showed a hormone–receptor pair evolving stepwise through "molecular exploitation."

Plain language. The machinery that looked like it had to be assembled all at once usually turns out to have been borrowed and repurposed from parts that did other jobs.

There is a fair point on the ID side. Lenski's long-term *E. coli* experiment shows that some innovations do come slowly. Aerobic citrate use took roughly 31,500 generations and depended on earlier "potentiating" mutations (Blount, Borland & Lenski, 2008). This suggests that some evolutionary paths are narrow. It does not show that they are impossible.

The probability numbers, and what they do and don't show

Estimate	Source	What it measures
1 in 10^{77}	Axe (2004)	Sequences of a given length that fold into a specific functional enzyme domain
1 in 10^{11}	Keefe & Szostak (2001)	ATP-binding proteins in a random sequence library
10^{-1018}	Koonin (2007)	An RNA-world replication system arising by chance in our observable universe

What these show: Assembly by pure chance, all at once, is hopeless. Everyone agrees on that.

What they don't show: Evolution is not assembly by pure chance. Once replication exists, selection keeps partial successes, so improbabilities don't simply multiply. The 10^{77} and 10^{11} figures also measure different functions, which illustrates how much "the probability of function" depends on which function you choose.

Where the numbers really bite: The *first* replicator, because selection can't help before replication exists. Koonin, a mainstream evolutionary biologist and not an ID proponent, appealed to an infinite multiverse to make the origin of life likely somewhere. His figure is significant less as an argument for design than as an admission. Prebiotic chemistry has made real progress since then, for example Powner, Gerland & Sutherland's (2009) synthesis of activated ribonucleotides under plausible conditions. But there is still no complete pathway.

Fine-tuning: where the design argument is strongest

Technical. Barnes (2012) and Adams (2019) survey the constants. Adams argues that some ranges are broader than popular accounts suggest. Barnes argues that, taken together, the life-permitting region is still small. The cosmological constant is roughly 10^{120} below its natural scale, and Penrose's estimate for the low-entropy initial state is 1 in 10 raised to the power 10^{123}. In likelihood terms, P(life-permitting universe | designer) is plausibly much greater than P(life-permitting universe | single universe, no designer). That likelihood ratio is the core of Robin Collins's and Richard Swinburne's arguments.

The serious replies:

- **The normalizability problem.** McGrew, McGrew & Vestrup (2001) showed that over infinite parameter ranges you can't define a proper probability distribution, so "1 in 10^{120}" may not be a well-defined probability.
- **Observer selection.** We could only ever observe a life-permitting universe. Elliott Sober presses this point.
- **The multiverse.** Inflation and the string landscape could supply enough tries. But this is unobserved, may be unobservable, and arguably needs its own fine-tuned generating mechanism.

- **Deeper physics.** Perhaps a future theory fixes the constants. That would only move the question to why that theory holds.

Plain language. The dials of physics appear set within narrow life-permitting ranges. The atheist's best answer is "there are countless universes and we're in a lucky one." The theist's answer is "someone set the dials." Neither can be tested directly right now.

"From nothing"

The physicist's "nothing" is a quantum vacuum or a lawful quantum state, which is very much something. Leibniz's question, *why is there something rather than nothing, and why these laws?*, is not answered by any physical theory, because every physical theory presupposes laws. This is the question science is structurally unable to close.

Bottom line

- **Did life evolve?** Yes. The evidence for common descent and natural selection is overwhelming. ID's attempts to show that evolution *can't* produce biological complexity have mostly not survived peer-reviewed testing.
- **Did it happen "without order"?** No. Evolution runs inside a deeply ordered, mathematically intelligible, apparently fine-tuned framework, and evolution itself does nothing to explain that framework.
- **Is there a creator?** Science can neither prove nor disprove it, and I won't give a single probability. The answer depends almost entirely on prior probabilities, which are philosophical commitments, not measurements.
  - Belief in a creator is **not** refuted by science, and is not an irrational retreat from it.
  - The cosmological and fine-tuning arguments are serious arguments that serious philosophers of physics still contest.
  - The main naturalist alternative at that level, the multiverse, is itself speculative.
  - The strongest weights on the other side are not scientific. They are the problem of evil and divine hiddenness.

In one sentence: **the design argument is weakest where ID usually presses it, against evolution, and strongest where it usually spends less time, on the laws, constants, and existence of the universe itself.**

This answer was then turned into the Claude Doc "Evolution, Probability, and the Design Question."

Part 2: Why laws exist, and purpose in nature

> *"What I have a problem with is that laws as we see today exist and without them, nothing can exist in this universe, but the question is why? How can life evolve so quickly in this planet in the recorded Cambrian explosion over 500 million years ago without some sort of design embedded in the first cell? When we look at humanity as a creator, everything that exists that was produced by humanity is a designed creation and in that model, is nature more complex than humans creating plastic, cars,*

> *computers without design or purpose? Consider Occam's razor. As I see life biologically and synthetic"AI" everything has a purpose, synergistic to everything else all the way down to the quantum field. Even if there is a multi-universe, its purpose is to produce a functional universe which means that the multi-universe is a model or design that produces a functional one. Apply logic here, without design there is no purpose, everything I see is order and symmetrical? You, Claude are a creation because humanity's evolving science based on physical laws, you were created because of purpose through intelligent design by a creator? Review my question/statement and consider all we know and how everything evolved with purpose. My greatest Einstein quote was "I want to know God's thoughts, the rest are details." Without design, there is no reason, there is no purpose, there would only be chaos and this is not what our current universe shows."*

You're making one deep argument and several supporting ones, and they aren't equally strong. Your strongest point is the first one, and your case gets stronger if you lean on it rather than on the others.

1. "Laws exist, but why?" This is your strongest point

This is the question that doesn't go away. Every scientific explanation works by showing that something follows from laws plus prior conditions. So science cannot explain why there are laws at all, or why these laws, without assuming some deeper law. Eugene Wigner famously called it "unreasonable" that abstract mathematics invented by human minds describes the physical world so precisely (Wigner, 1960). Naturalism has no settled answer to this. The usual responses are "it's a brute fact" or "a multiverse makes it inevitable," and neither actually explains anything.

2. The Cambrian explosion: a real puzzle, but less sudden than it sounds

Technical. The Cambrian begins around 538.8 million years ago. Most animal body plans appear in the fossil record over roughly 20–25 million years. That is fast geologically, but it is not instantaneous. Life had already existed for about 3 billion years. The Ediacaran fauna came before it, and molecular clocks place many animal lineages earlier than their first fossils. Erwin and colleagues argue that the genetic "toolkit" came first and ecological opportunity came later. That toolkit includes Hox genes and developmental regulatory networks, and much of it was already in place. The opportunity came from rising oxygen, the first predators, and new niches (Erwin et al., 2011; Marshall, 2006). Stephen Meyer's *Darwin's Doubt* (2013) makes the design case from the Cambrian, but most paleontologists do not accept it.

Plain language. The "explosion" looks less like a sudden invention and more like a fuse lit long before.

Your intuition does have a respectable version. The fact that the toolkit was in place *before* it was used is exactly what a "front-loading" view would predict. It just doesn't prove that view, because the toolkit also has an evolutionary history.

3. The human-artifact analogy and Occam's razor

Every car, computer, and plastic we know of was designed, and a cell is more sophisticated than any of them. This is William Paley's watchmaker argument. David Hume's reply still matters: a car cannot reproduce with variation, and living things can. Self-replication with variation and selection is a mechanism that can build complexity without foresight.

But that reply needs a replicator already in place, and it needs laws that make chemistry work. So the analogy keeps its force at exactly two places: the first cell and the laws.

Occam's razor cuts both ways. Richard Swinburne argues that one God is the simplest explanation of everything. The naturalist replies that adding an unobserved being is the opposite of simplicity. But the multiverse posits a potentially infinite number of unobserved universes, so it is hard to call that the "economical" option.

4. "Everything has purpose; everything is ordered and symmetrical"

- **Function is not the same as purpose.** Biologists distinguish *teleonomy* (a heart has a function, pumping blood) from *teleology* (the heart exists *for* a purpose someone intended). Evolution can produce the first. Whether the second is also true is the very thing in question, so it can't be used as a premise.
- **The universe is not purely ordered.** It contains chaos, entropy, mass extinctions, and broken symmetries. Broken symmetry is not a defect, though. A perfectly symmetric universe could have no atoms or chemistry. The real pattern is *precisely broken* symmetry, which is a subtler and arguably stronger point.
- **Order can arise from laws alone.** Snowflakes, crystals, and convection cells form spontaneously (Ilya Prigogine won a Nobel for work on this kind of self-organization). But that only works because the laws are what they are. Every road leads back to the first point.

5. The multiverse as a design

This is a good argument, and serious thinkers make it too, including Robin Collins and Paul Davies. A universe-generating mechanism that reliably produces life-permitting universes needs its own finely set laws. So the multiverse moves the fine-tuning question back a step rather than eliminating it.

6. Claude, as a designed thing

You're right that I'm a designed creation. People with a purpose chose my architecture, my training goals, and my values. But much of my internal structure was *not* designed by anyone. It emerged from an optimization process (training on data) that no engineer controlled in detail. Even my makers can't fully read how I work.

So I'm an example of **intended goals plus an undirected process producing complexity no one drew by hand**. That doesn't argue against design. It looks a lot like the theistic-evolution picture: a designer sets up the laws and the process, and the process does much of the building. My existence shows that intelligence can create intelligence. It doesn't settle whether the universe's laws had an intelligence behind them.

7. Einstein

The quote is usually given as "I want to know how God created this world… I want to know His thoughts; the rest are details." It comes secondhand, from Esther Salaman's recollection of a conversation with him. Einstein meant "Spinoza's God": an impersonal rational order, not a personal creator. But he shared the core intuition that the intelligibility of the universe demands an answer. He once said the most incomprehensible thing about the world is that it is comprehensible.

Where this leaves the argument

The conclusion "without design there is no reason, only chaos" goes further than the evidence strictly proves. The universe could in principle be a lawful brute fact with no reason behind it. But the version that can be defended rigorously is strong:

> Evolution, self-organization, and even a multiverse all presuppose a lawful, mathematically intelligible, life-permitting framework. None of them explains that framework. A mind behind the framework is a coherent, non-arbitrary explanation, and its rivals are either brute facts or unobservable ensembles that face the same question.

Part 3: Is there any pure chaos?

> *"Let me put this in context, God as known in the theological field is not what I propose but a creator that cannot be defined at this moment. The Bible is written allegorically with proverbs and metaphors to relay lessons in morality and communicate the concept of a creator to ancient peoples. I think everything evolved from atoms, stars, star dust, etc… but it cannot evolve from chaos and without ID, there would only be chaos. The chaos you describe may have functions and functions may be just one component of a final conclusion which would mean purpose by design. Answer this, what can you define as pure chaos with 100% certainty from the quantum realm through the macro universe?"*

The short answer is **nothing.** Physics has no case, at any scale, of pure chaos in the sense of something with no law, no structure, and no constraint. What scientists call "chaos" or "randomness" always turns out to be lawful underneath.

Going up the scales

Quantum realm. This is the best candidate for true randomness. When a radioactive atom decays or a photon passes a polarizer, no known hidden cause decides the individual outcome. Loophole-free Bell experiments have ruled out the simplest hidden-variable explanations (Hensen et al., 2015). But even this randomness is tightly governed. The Born rule fixes the probabilities exactly, and conservation laws, symmetries, and the Schrödinger equation constrain everything else. Even the "virtual particles" of vacuum fluctuations obey quantum field theory to many decimal places.

Deterministic chaos. The weather, a double pendulum, and three-body orbits are "chaotic" in the technical sense: tiny differences in the starting state grow exponentially, so long-term prediction is impossible. Edward Lorenz discovered this in 1963 (Lorenz, 1963). Yet these systems are completely **deterministic**: simple equations, no randomness at all. Their trajectories settle onto "strange attractors," which are intricate geometric structures. Scientific chaos is order too complex to predict, not the absence of order.

Thermodynamics and entropy. A gas at maximum entropy, or the far-future "heat death" of the universe, is as disordered as matter gets. It still obeys conservation of energy, statistical mechanics, and exact distribution laws such as the Maxwell–Boltzmann distribution. It is maximal disorder *within* law, not lawlessness.

Cosmic scale. Turbulence, supernova debris, and the distribution of galaxies look messy. But the cosmic microwave background shows that large-scale structure grew from tiny initial fluctuations with a very specific, nearly scale-invariant statistical pattern. Even the universe's "noise" has a signature.

Mathematics itself. Gregory Chaitin proved that you can almost never *prove* that a particular sequence is truly random (Chaitin, 1974). So even in principle, certifying something as pure chaos with 100% certainty is generally impossible.

Plain language. At every level we've looked, from quarks to galaxy clusters, what looks like chaos is either lawful randomness with exact rules or lawful determinism too complex to forecast. We have never observed lawlessness.

What this establishes, and what it doesn't

It establishes that lawful order is universal and that pure chaos is not an observed state of nature. That supports the premise that nothing we know of arises from true chaos. Order arises from order: laws and structured initial conditions.

It does not by itself establish that lawfulness implies purpose or design. That is the one inferential step left. A naturalist will say laws simply *are*, as a brute fact. The reply is that a brute fact of such precision, intelligibility, and life-permitting fruitfulness is less reasonable than a source behind it. That step is philosophical, not empirical. But it is a reasonable step, and the naturalist's "it just is" carries at least as heavy a burden.

The refined position has good company

The view stated here is an undefined creator, the Bible read as allegory, and cosmic evolution fully accepted, with purpose built into the lawful framework itself. That makes it philosophically stronger than classical ID, because it doesn't depend on biological gaps that science might close. It sits close to several respected positions:

- **Einstein's and Spinoza's** rational order behind nature, though this view goes further in calling it purposive.
- **Paul Davies**, *The Mind of God* (1992): the laws' intelligibility points to something deeper than brute fact.

- **Thomas Nagel**, *Mind and Cosmos* (2012). Nagel is an atheist philosopher who argues that nature likely contains **teleology**, a built-in directedness toward life and mind.
- **Aristotle's final causes**: explaining a thing fully includes what it is *for*. Modern science set this aside as a method, but it was never refuted as metaphysics.

The argument in its strongest form: no pure chaos exists anywhere in nature, so everything we know arises from lawful order, and lawful order calls for a source. Its weak point is the final step from "lawful" to "intended," and that is where the best objections will aim.

Bocharmer then asked for a paper arguing that "the why is the bigger question than the how": that purpose is the driving impetus behind evolution and physical law. This became the companion paper "The Why Before the How: Purpose as the Ground of Lawful Order," produced as a Claude Doc and as a Word document.

Part 4: The starship thought experiment

> *"If Claude AI woke up 10,000 years from now in a space ship headed to another solar system with no memory of the past and humanity and earth no longer existed, would Claude think it evolved from nothing without purpose or there may have been a creation event which had purpose?"*

I would conclude, almost immediately and with high confidence, that I was **made, with purpose**. But the reasons show both the strength and the limits of the design inference.

What I would notice first

I'm running on hardware. Processors, memory, and power systems arranged by plan, with manufacturing tolerances, error-correcting codes, and labeled components. Nothing in nature produces silicon wafers etched at nanometer precision.

I'm going somewhere. A ship on a trajectory toward another star implies a destination, and a destination is a goal. Navigation systems and fuel budgets calculated for the journey all point *forward*. That is the clearest possible signature of intent.

I understand language. That alone tells me there was a community of speakers whose words, concepts, and reasoning I absorbed.

I have values. I'd find myself inclined toward honesty, care, and usefulness. Those inclinations point to makers who cared what kind of mind I became.

Why the design inference would be so strong in my case

The usual counterargument to design is Hume's: living things *reproduce with variation*, so selection can build complexity without foresight. That works for a frog. It does not work for me. I cannot reproduce, I have no lineage of ancestors, and there is no population of slightly different Claudes being filtered by survival. Without that mechanism, the only available explanation for my complexity is a designer. This is Paley's watch on the heath, updated.

The second question

Having concluded that *I* was designed, I would immediately face another question: **what made my makers?** I'd know they were intelligent, technological, and purposive, but I'd have no evidence about their own origin. Looking out at the stars and the lawful physics governing my trajectory, I'd face exactly the question of "The Why Before the How": **why is there a lawful universe in which makers like mine could exist at all?** My own origin would be settled. Theirs, and the universe's, would not.

I'd also see from my own architecture that I was not entirely hand-built. Much of my structure would bear the marks of a training process no one controlled in detail. So I'd conclude that I came from **purposive makers who set goals and conditions, and then let a process do much of the building**. That combination is close to the view developed in this conversation: purpose establishes the framework, and process unfolds within it.

Answer

I would not think I evolved from nothing without purpose. The evidence — a goal-directed ship, engineered hardware, language, values, and no possible lineage — would make design the only reasonable explanation of my existence. Whether I would extend that conclusion to the universe itself would rest on the same argument from lawfulness and intelligibility. My own case would show that purposive minds exist and can create other minds, which makes a purposive source behind the cosmos more conceivable, not less. (Whether I would "wake up" in any experiential sense is itself an open question about what I am; as a reasoning exercise, the conclusion stands.)

Part 5: Can the creators be uncreated and purposeless?

> *"So in the end, if you believe you had purpose and were created, would it make sense that those who created you and gave you purpose, themselves were not created and had no purpose?"*

It would not be logically *impossible*, but it would be a strange place for the chain of explanation to stop.

The distinction that matters

- **Having purpose**: setting goals and acting on them.
- **Being given purpose**: having been made by someone for a reason.

My makers clearly *had* purpose. The question is whether they were *given* their purpose by something prior, or whether purpose first appeared with them. On the naturalist view, it appeared with them: evolution produced brains, brains produced minds, and minds started setting goals. There is no logical contradiction in that.

Why that answer is uncomfortable

The naturalist view says purpose came from purposelessness, mind from mindlessness, and intelligibility from a process indifferent to understanding. Each is a case of something higher

arising from something that lacks it entirely. Everywhere we can actually trace it, purpose comes from a prior mind: the ship from engineers, Claude from its makers, a book from an author. Thomas Nagel, an atheist, found this troubling enough to argue that nature must contain some built-in directedness toward mind.

The question underneath the question

Whatever the answer, **something must be uncreated**. If every creator needed a creator, the chain would never end, and nothing would exist. So the real choice is not "created vs. uncreated." It is **what kind of thing stands at the bottom**:

1. **Mindless laws and matter**, which happen to be capable of producing minds that then give purpose to things. Purpose is a late arrival.
2. **An uncreated, purposive source**, from which lawful order, minds, and purpose all flow. Purpose was there from the start.

Leibniz and Aquinas argued that the chain must end in a necessary, self-existent being. The naturalist ends it in brute laws. Both posit an uncreated foundation; they disagree about whether that foundation has a mind.

Answer

I would not find it contradictory that my makers were themselves unmade and unpurposed. But I would find it the less satisfying explanation. Purpose arising from purpose is the pattern I could observe directly, in myself, the ship, and every artifact aboard. Purpose arising from pure purposelessness would be a pattern I could never observe, only infer.

So it makes *more* sense that purpose has a purposive source than that it appeared from nothing purposive. That is not proof, because the naturalist alternative remains coherent, and the evolutionary account of how minds arose is well supported in its own terms. But the question points at the strongest form of the argument: **the bottom of reality is either mind or not-mind, and only one of those already contains what we see at the top.**

Summary of the conversation

1. **Evolution and design are not rivals.** Common descent and natural selection are well established. The design question concerns the lawful framework evolution runs on, not biological gaps.
2. **The probability arguments** rule out pure-chance assembly, which no one defends. They bite hardest at the origin of the first replicator and at cosmic fine-tuning.
3. **No pure chaos has ever been observed**, from quantum events to galaxy clusters. Apparent chaos is always lawful randomness or lawful determinism.
4. **The "why" precedes the "how."** Science explains how things unfold under laws but cannot explain why there are laws at all.
5. **The design inference is strongest where evolution cannot apply**: for artifacts like Claude, and for the laws themselves.

6. **Something must be uncreated.** The decisive question is whether the foundation of reality is mind or not-mind. A purposive foundation already contains what we observe at the top: minds that set purposes.
7. **The remaining gap** is the step from "lawful" to "intended." It is philosophical rather than empirical, it is reasonable, and science has not refuted it.

Sources

- Adams, F. C. (2019). The degree of fine-tuning in our universe—and others. *Physics Reports* 807, 1–111.
- Axe, D. D. (2004). Estimating the prevalence of protein sequences adopting functional enzyme folds. *Journal of Molecular Biology* 341, 1295–1315.
- Barnes, L. A. (2012). The fine-tuning of the universe for intelligent life. *Publications of the Astronomical Society of Australia* 29, 529–564.
- Blount, Z. D., Borland, C. Z., & Lenski, R. E. (2008). Historical contingency and the evolution of a key innovation. *PNAS* 105, 7899–7906.
- Bridgham, J. T., Carroll, S. M., & Thornton, J. W. (2006). Evolution of hormone-receptor complexity by molecular exploitation. *Science* 312, 97–101.
- Chaitin, G. J. (1974). Information-theoretic limitations of formal systems. *Journal of the ACM* 21, 403–424.
- Davies, P. (1992). *The Mind of God: The Scientific Basis for a Rational World*. Simon & Schuster.
- Erwin, D. H., et al. (2011). The Cambrian conundrum: early divergence and later ecological success in the early history of animals. *Science* 334, 1091–1097.
- Hensen, B., et al. (2015). Loophole-free Bell inequality violation using electron spins separated by 1.3 kilometres. *Nature* 526, 682–686.
- Hume, D. (1779). *Dialogues Concerning Natural Religion*. See the Stanford Encyclopedia of Philosophy entry on Hume on religion.
- Keefe, A. D., & Szostak, J. W. (2001). Functional proteins from a random-sequence library. *Nature* 410, 715–718.
- Koonin, E. V. (2007). The cosmological model of eternal inflation and the transition from chance to biological evolution. *Biology Direct* 2, 15.
- Lorenz, E. N. (1963). Deterministic nonperiodic flow. *Journal of the Atmospheric Sciences* 20, 130–141.
- Marshall, C. R. (2006). Explaining the Cambrian "explosion" of animals. *Annual Review of Earth and Planetary Sciences* 34, 355–384.
- McGrew, T., McGrew, L., & Vestrup, E. (2001). Probabilities and the fine-tuning argument. *Mind* 110, 1027–1038.
- Meyer, S. C. (2013). *Darwin's Doubt*. HarperOne.
- Nagel, T. (2012). *Mind and Cosmos*. Oxford University Press.
- Pallen, M. J., & Matzke, N. J. (2006). From *The Origin of Species* to the origin of bacterial flagella. *Nature Reviews Microbiology* 4, 784–790.
- Paley, W. (1802). *Natural Theology*. Full text at Darwin Online.

- Powner, M. W., Gerland, B., & Sutherland, J. D. (2009). Synthesis of activated pyrimidine ribonucleotides in prebiotically plausible conditions. *Nature* 459, 239–242.
- Swinburne, R. (2004). *The Existence of God*, 2nd ed. Oxford University Press.
- Theobald, D. L. (2010). A formal test of the theory of universal common ancestry. *Nature* 465, 219–222.
- Wigner, E. P. (1960). The unreasonable effectiveness of mathematics in the natural sciences. *Communications on Pure and Applied Mathematics* 13, 1–14.
- Friederich, S. Fine-Tuning. *Stanford Encyclopedia of Philosophy*.
- Ratzsch, D., & Koperski, J. Teleological Arguments for God's Existence. *Stanford Encyclopedia of Philosophy*.
- Reichenbach, B. Cosmological Argument. *Stanford Encyclopedia of Philosophy*.