

Mere Theistic Evolution Cannot Be (and Never Was) Mere *A Response to John Churchill and Michael Murray*

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ABSTRACT:

Churchill and Murray (2019) criticize my chapter on common descent in *Theistic Evolution* (2017) for what they argue is its illicit extension of doubts about universal common descent (UCD) to the theory of evolution itself. This criticism is groundless. I take pains to distinguish UCD from “evolution,” because the latter is defined in 2019 not by a univocal or canonical scientific theory, but by a philosophical boundary, namely, naturalism (whether philosophical or methodological is irrelevant). “Evolution” in this sense survives empirical critique. It is a paradigmatic commitment to a particular form of causal explanation, not to any biological theory.

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“Without God. We are excluding God.”

Biologist Eva Jablonka of Tel Aviv University, at the November 2016
Royal Society meeting on revising the Neo-Darwinian Synthesisⁱ

I. A Criticism Readily Dispatched – Yet the Deeper Puzzle Behind It

In their review of *Theistic Evolution: A Scientific, Philosophical, and Theological Critique* [abbreviated *SPTC*], John Churchill and Michael Murray (hereafter, C&M) argue that my chapter, “Five Questions Everyone Should Ask About Common

ⁱWhile the audio recording reveals scattered laughter, it also reveals that no one at the Royal Society meeting challenged this statement. Jablonka’s remark occurred during the roundtable discussion on the afternoon of Tuesday, 8 November 2016. She had asked evolutionary biologist Douglas Futuyma, one of the plenary speakers, what he would consider a *bona fide*, rather than only cosmetic, revision of neo-Darwinian theory. Jablonka’s question begins at 29:39 of this Royal Society mp3 file, with the “We are excluding God” remark occurring at 30:29: <http://downloads.royalsociety.org/events/2016/11/evolutionary-biology/panel-tues.mp3>

Descent,” misrepresented the status of theistic evolution, by linking doubts about the theory of universal common descent (UCD) to the concept of evolution itself. C&M write:

It is fair to conclude from this, as Paul A. Nelson does...that “the theory of common ancestry is in trouble; possibly very serious trouble, from which it may never escape.” **But does this mean that evolutionary theory or theistic evolution is in trouble, as is also implied in Nelson’s chapter?** Not at all. Evolutionary biologists were in fact quite keen to adopt this insight, and to revise their understanding of the natural processes that governed the development of early life on our planet. The key discovery did not undermine the evolutionary account of life but rather provided an evidence-driven supplement to it...**The lesson here is that in some cases, the arguments in *SPTC* that attempt to provide scientific evidence against evolution or theistic evolution miss their mark.** Doubtless it is true that some of these scientific findings show that earlier accounts of evolution were incorrect. But rather than undermining the theory, they provide useful complements to it. (emphasis added)

This criticism is readily dispatched. My chapter on UCD carefully distinguished UCD from evolution itself, in a way which no attentive reader could miss. (See the Appendix for full citations.) I explained in the chapter’s introduction that evolutionary biologists who have abandoned UCD have *not* abandoned the more general thesis of evolution, or turned to intelligent design (ID). To ensure that this important distinction was not overlooked, I included a diagram from the historian of biology Peter Bowler, depicting the polyphyletic geometry suggested by Lamarck’s evolutionary ideas.ⁱⁱ I also included a table showing a four-quadrant matrix of scientific opinion, where leading evolutionary biologists landed on both sides of the UCD versus ~UCD question. (Again, see the Appendix.) C&M claim that I implied evolution was “in trouble” because of the changing fortunes of UCD. The pages they cite, however, 406 and 421, do not support their claim, nor do they quote me directly. Maybe during our discussion on November 20 they can explain, with specific quotations from chapter 12, where I said that doubts about UCD entailed skepticism about evolution itself.

“But surely,” the reader may be wondering, “Nelson must think that casting doubt on UCD *also casts some doubt on theistic evolution?*” Otherwise, why include the “Five Questions” chapter in the *SPTC* volume?

ⁱⁱ *Polyphyly* (adj. *polyphyletic*; Gk: “multiple branches” or origins) yields the contrast class to *monophyly* (adj. *monophyletic*; Gk: “single branch” or origin). Darwin’s (1859) Tree of Life is monophyletic, as is the neo-Darwinian geometry of universal common descent (UCD); other evolutionary geometries, such as Lamarck’s, or Haeckel’s, are polyphyletic.

Funny you should ask. There's an important backstory that needs telling, which I lacked the space to treat in *SPTC*. Here is the short version:

The empirical content of “evolution” has shifted so radically over the past five decades that the term now largely means “the origin and diversification of living things *by any cause other than intelligent design*” (ID). Thus, doubts about UCD do not entail the rejection of evolution itself, because evolution can mean almost anything – except, of course, ID. On this view, evolution is not so much a scientific theory as it is a philosophical commitment to telling a naturalistic story about origins.

And that is why I did not try to argue in the “Five Questions” chapter against evolution *simpliciter*. Rather, I explained how new lines of evidence have raised doubts about UCD, which represents only one of many possible evolutionary topologies or geometries for life on Earth. UCD is the most widely-accepted such geometry today, but even if UCD should topple, evolution itself would remain standing. That is why those evolutionary biologists who have jettisoned UCD can remain firmly committed to the more general evolutionary project. They are committed, however, not to a specific *scientific* theory, but to an answer of a particular *philosophical* kind.

“Never mind about philosophy right now,” objects the reader. “If evolution, however we conceive it, remains standing, isn't that precisely C&M's point? – namely, that evolution happily accommodates new data, with biologists revising and expanding the theory as biological knowledge grows?”

Time for the longer version of the backstory. Here's a preview:

Contra C&M, it is not a strength of evolution as a scientific theory (although this move may sustain the idea indefinitely as a philosophical position) that, when its core propositions are contradicted by new findings, the theory embraces those findings, while at the same time tossing the erstwhile core propositions over the starboard railing of the ship. That is a problem for evolution – and hardly a small one.

We should consider the empirical details next.

II. Back in the Day, “Evolution” Meant Something

In 1985, evolutionary geneticist Francisco Ayala (who in 1995 was to become the president of the AAAS) published an article on what he called the “fact” of evolution (Ayala 1985). Under the heading of “evolution as fact,” Ayala said that the single proposition “most fundamental” and “most definitely corroborated by science,” undergirding the theory's factual standing, was the common ancestry of all life on Earth. This is the geometry of historical relatedness, Darwin's Tree of Life,

designated above as universal common descent, or UCD. This theory, Ayala (1985, 59-60) continued,

is a scientific conclusion established with a certainty similar to that of notions such as the roundness of the earth, the motions of the planets, and the molecular composition of matter. This degree of certainty beyond reasonable doubt is what is implied by scientists when they say that the evolution of organisms is a “fact.”

Six years later, National Academy of Sciences molecular biologist Russell Doolittle wrote that “it is widely accepted that all life on Earth today is descended from a common ancestral cellular organism that existed sometime between 1.5 and 3.0 billion years ago” (1991, 165) – i.e., UCD, or the Tree of Life, rooted in the Last Universal Common Ancestor (LUCA). This canonical standing of UCD, “beyond reasonable doubt,” can be seen in any biology textbook from the 1960s to the early 1990s. It remains the default position of most working biologists today.

Central to the canonical epistemic standing of UCD during this period was the apparent universal conservation of the key molecular features of life: DNA, RNA, proteins assembled from the same set of 20 [now 22] amino acids, the universal genetic code, the ribosome, and so on. “If there is a unity of life based on evolution [i.e., UCD],” argued evolutionary biologist John Moore (1984, 509), “that should be reflected in the molecular processes of organisms.” Let’s call this a core proposition of evolution in the 20th century.

The explanatory rationale for the expectation of universal molecular conservation was *functional*. Once these basic cellular features were invented by whatever natural processes caused them, and established in LUCA, organisms would not tolerate their modification – lethality being the inevitable consequence of any modification. There could be no crossing (or so it was widely held) such a “‘Death Valley’ in the adaptive landscape” (Lehman 2001, R63). Hence, the observed universality of those key features today.

Consider, for instance, the apparent universality – *circa* the early 1980s – of the genetic code. As James Watson *et al.* (1987, 453) expressed the point,

Consider what might happen if a mutation changed the genetic code. Such a mutation might, for example, alter the sequence of the serine tRNA molecule of the class that corresponds to UCU, causing them to recognize UUU sequences instead. This would be a lethal mutation in haploid cells containing only one gene directing the production of tRNA^{ser}, for serine would not be inserted into many of its normal positions in proteins. Even if there were more than one gene...this type of mutation would still be lethal, since it would cause the simultaneous replacement of many phenylalanine residues by serine in cell proteins.

The following schema captures the logical structure of this argument, which, again, we can call a core proposition:

(1) Evolution \supset UCD + the code cannot vary \rightarrow universal genetic codeⁱⁱⁱ

Now, if you are reading this online, click on this link at the National Center for Biotechnology Information:

<https://www.ncbi.nlm.nih.gov/Taxonomy/Utils/wprintgc.cgi>

Here is what you will find there, if you are not online:

The following genetic codes are described here:

- [1. The Standard Code](#)
- [2. The Vertebrate Mitochondrial Code](#)
- [3. The Yeast Mitochondrial Code](#)
- [4. The Mold, Protozoan, and Coelenterate Mitochondrial Code and the Mycoplasma/Spiroplasma Code](#)
- [5. The Invertebrate Mitochondrial Code](#)
- [6. The Ciliate, Dasycladacean and Hexamita Nuclear Code](#)
- [9. The Echinoderm and Flatworm Mitochondrial Code](#)
- [10. The Euplotid Nuclear Code](#)
- [11. The Bacterial, Archaeal and Plant Plastid Code](#)
- [12. The Alternative Yeast Nuclear Code](#)
- [13. The Ascidian Mitochondrial Code](#)
- [14. The Alternative Flatworm Mitochondrial Code](#)
- [16. Chlorophycean Mitochondrial Code](#)
- [21. Trematode Mitochondrial Code](#)
- [22. Scenedesmus obliquus Mitochondrial Code](#)
- [23. Thraustochytrium Mitochondrial Code](#)
- [24. Pterobranchia Mitochondrial Code](#)
- [25. Candidate Division SRI and Gracilibacteria Code](#)
- [26. Pachysolen tannophilus Nuclear Code](#)
- [27. Karyorelict Nuclear Code](#)
- [28. Condylostoma Nuclear Code](#)
- [29. Mesodinium Nuclear Code](#)
- [30. Peritrich Nuclear Code](#)
- [31. Blastocrithidia Nuclear Code](#)
- [33. Cephalodiscidae Mitochondrial UAA-Tyr Code](#)

Every year, this list of variant or non-universal genetic codes grows longer.

But what about our core proposition, (1), above? – which, until recently, could be found in nearly any biology textbook, starting from the late 1960s. (The universality of the code was predicted in 1963, in the journal *Science*, by Ralph Hinegardner and Joseph Engelberg. They used schema or proposition [1].)

It seems proposition (1) needs some adjusting:

(2) Evolution \supset UCD + *guess what, the code does vary* \rightarrow variant genetic codes

With a minor tweak we have “saved the phenomena.” Erase proposition (1); we will revise those textbooks, and incorporate proposition (2).

ⁱⁱⁱ Read the “ \supset ” symbol as *material implication*: if, then.

“Listen, Paul,” the reader objects, “this happens all the time with mature scientific theories. New findings may challenge their auxiliary hypotheses, such as – in this instance – the necessary functional invariance of the genetic code. Nevertheless, the core propositions, such as UCD, or evolution itself, still hold.”

Well, yes: evolution still holds. As I have been arguing, however, that is decidedly not a good outcome for evolution, if we wish to see it as a scientific theory, rather than a philosophical commitment. So we should consider next why many leading evolutionary biologists have now dumped UCD – one cannot, after all, find a more core proposition than UCD – to see if evolution itself was ever threatened.

The answer is no.

III. Non-Orthologous Gene Displacement (NOGD) as a Case Study

Roll the tape ahead to 2007, and a major paper by National Academy of Sciences molecular geneticist and NCBI lab director Eugene Koonin:

...it is generally assumed that, in principle, the TOL [Tree of Life, UCD] exists and is resolvable...Here, I argue for a fundamentally different solution, i.e., that a single, uninterrupted TOL *does not exist*, although the evolution of large divisions of life for extended time intervals can be adequately described by trees. I suggest that evolutionary transitions follow a general principle that is distinct from the regular cladogenesis [evolutionary branching]. I denote this principle the Biological Big Bang (BBB) Model. (2007, 3; emphasis in original)

What happened? Evolution’s core proposition of universal common descent, which Ayala (1985) said was as indubitable as “the roundness of the earth,” is being jettisoned. Over the railing goes UCD, into the water. Why?

What happened was the birth of a new method of molecular data gathering in biology, as historically important to that science, it turns out, as the invention of the telescope was to astronomy. From stage right in the mid-1990s, rapid and increasingly inexpensive DNA sequencing entered biology, and quickly became a widely-used research technology. For the first time, biologists could survey vastly more, and in many cases, genomically complete DNA sequences from a multitude of species. Before 1995, molecular comparisons among species, based on single gene or protein sequences, were akin to trying to map the entirety of New York City by measuring 10 inches of curb in Brooklyn and Manhattan, a foot or two in Staten Island, and another small section of curbstone in Queens and the Bronx.

In brief, whole genome DNA sequencing has overturned the genetic “unity of life” described by Moore (1984) and prominent in biology textbooks for the last fifty years. One remarkable finding in this respect has been termed “non-orthologous gene displacement” (NOGD), an awkward phrase which means simply that the

expected conservation (*orthology*) of genes and proteins, when assessed across the Tree of Life, and as predicted by universal common descent, is not observed. Rather, in the central information-processing and metabolic pathways inferred to have been present in LUCA, different (*non-orthologous*) genes and their protein products have “displaced” what biologists expected to find.

Table 1 and Figure 1 show (respectively) sober biological versus homespun analogical representations of NOGD. Consider an especially striking example of NOGD: the molecular structure of release factor, an essential player in protein assembly within the ribosome. Ribosomes are unquestionably *the* most fundamental molecular machine in any free-living cell (viruses are defined by lacking ribosomes), the locus of action for turning DNA sequence information, via messenger RNA (mRNA), into functioning proteins. If you are a cell, or a collection of cells, on Earth, you must have ribosomes.

Biological Function	Gene(s)/ Protein(s)	Phyletic Spread of Form 1	Phyletic Spread of Form 2
DNA replication	DNA polymerase, primase, helicase	Archaea, eukaryotes, many dsDNA viruses of prokaryotes and eukaryotes	Bacteria
DNA precursor biosynthesis	Thymidylate synthase	Scattered among bacteria and archaea, most eukaryotes	Scattered among bacteria and archaea, a minority of eukaryotes
Translation	Lysyl-tRNA synthetase	Most bacteria, a minority of archaea, most eukaryotes	Most archaea, a minority of bacteria
Glucose-6-phosphate isomerase	Central carbohydrate metabolism	Most bacteria, some archaea, eukaryotes	A minority of bacteria, some archaea

Table 1. Examples of non-orthologous gene displacement (Koonin 2012, 70)

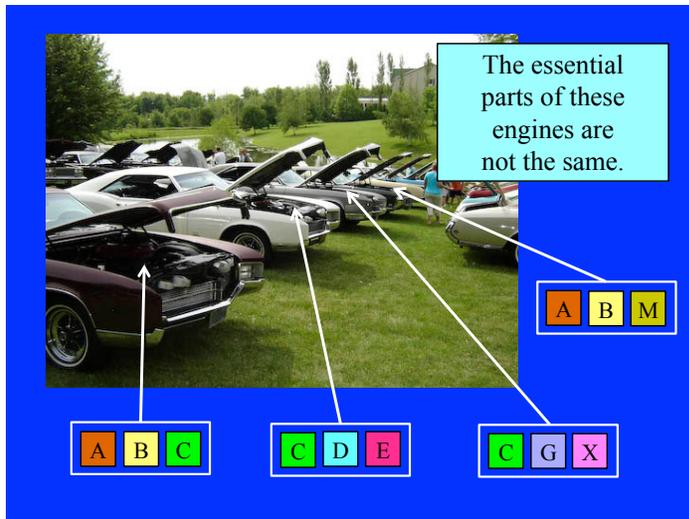


Figure 1. “Non-orthologous” automobile engines at a car show: key operating components differ fundamentally.

During translation of mRNA in the ribosome, most codons are recognized by "charged" transfer RNA (tRNA) molecules, called aminoacyl-tRNAs because they connect to specific amino acids corresponding to each tRNA's anticodon, the three-nucleotide signal on the mRNA-binding stem of the tRNA. But “stop,” or termination codons, are handled differently. In the so-called “universal” genetic code, there are three mRNA stop codons: UAG, UAA, and UGA. While these stop codons represent triplets, like ordinary amino-acid specifying codons, tRNAs do not decode them. Instead, in 1967, Mario Capecchi found that tRNAs do not recognize stop codons at all.^{iv} Rather, proteins he named "release factors" performed that task.

Briefly, when the ribosome, moving along an mRNA strand, arrives at a stop codon, release factor enters the ribosome and hydrolyzes (cuts) the chemical bond holding the last amino acid in the newly-synthesized protein to its corresponding tRNA. This “releases” the nascent protein to exit the large subunit of the ribosome, and fold – hence, the name for the family of proteins performing this essential task.

Now, mini-thought experiment. If LUCA existed, and possessed a DNA genome, ribosomes, and release factors – and if these features were functionally essential within LUCA, and therefore inherited by all its descendants – what should one expect to find, when surveying the protein folds (three-dimensional structures) of release factors across the Tree of Life? In other words: assume UCD, couple that monophyletic geometry to our knowledge of ribosomal function, and make a prediction.

^{iv} Except they do – if the species in question, such as the ciliated protozoan *Tetrahymena*, carries a variant genetic code. *Tetrahymena* possesses a single stop (UGA) and assigns UAA and UAG, stops in the universal code, to the amino acid glutamine. In 1967, however, these discoveries lay more than 20 years in the future.

Figure 2 depicts the three-dimensional structure of release factor from the bacterium *Escherichia coli* (domain Bacteria; Vestergaard *et al.* 2001):

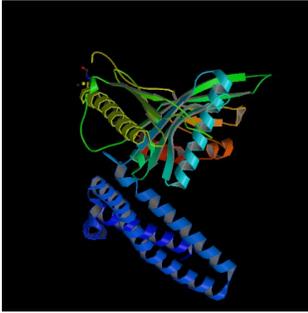


Figure 2. Crystal structure of *E. coli* release factor.

Figure 3 is the three-dimensional structure of release factor in *Homo sapiens* (domain Eukarya; Frolova *et al.* 2000)

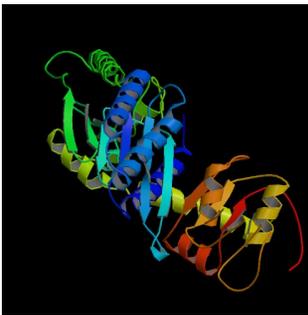


Figure 3: Crystal structure of *H. sapiens* release factor.

These are not the same proteins. They are non-orthologous: rotate them as you like, their three-dimensional structures remain topologically incongruent. Although the release factors perform the same *functional* task in the ribosome, they differ at the molecular level, in the same way a butterfly's wing differs from a bird's wing at the anatomical level: total absence of homology.

This raises what Baranov *et al.* (2006, 7) call "several unsolved puzzles":

Since there is no strong evidence for an evolutionary relationship between bacterial class-I RFs [release factors] and their counterparts from archaea and eukaryotes, it is unknown how termination was mediated in the last common ancestor.

Assuming, that is, that there *was* a last universal common ancestor (LUCA). For a growing cadre of evolutionary biologists, the wide extent of NOGD, when added to other molecular anomalies revealed by whole-genome sequencing, render the hypothetical construct of LUCA a problematical or non-existent entity, which

historical biology is better off without. The molecular unity of life, LUCA's original claim to fame, has been eroded away by unanticipated genetic findings:

As the genome database grows, it is becoming clear that NOGD reaches across most of the functional systems and pathways such that there are very few functions that are truly "monomorphic", i.e. represented by genes from the same orthologous lineage in all organisms that are endowed with these functions. Accordingly, the universal core of life has shrunk almost to the point of vanishing. (Koonin 2016, 417)

To be sure, UCD and the real existence of LUCA remain the default position for most working biologists, if for no other reason than disciplinary inertia, or because they do not bother to think about the large-scale comparative questions that motivate the growing community of UCD skeptics, such as the late Carl Woese, Eugene Koonin, W. Ford Doolittle, Didier Raoult, Eric Baptiste, or the other leading evolutionary biologists discussed in the "Five Questions" chapter of *SPTC*. But no one today would publish a claim about UCD such as Ayala's 1985 pronouncement of its factual certitude akin to the roundness of the Earth. Instead, each new genome sequenced chips away at UCD and LUCA, inexorably.

Nonetheless – evolution survives.

IV. Naturalism, Methodological or Otherwise, Guarantees Evolution's Survival

Faust:	Tell me who made the world.
Mephistopheles:	I will not.
Faust:	Sweet Mephistopheles, tell me.
Mephistopheles:	Move me not, for I will not tell thee.
Faust:	Villain, have I not bound thee to tell me anything?
Mephistopheles:	Ay, that is not against our kingdom; but this is.

Christopher Marlowe, *The Tragical History of Doctor Faustus*

To paraphrase the writer of Hebrews 11:32, "time would fail me" if I recited the many aspects – the core propositions – of textbook neo-Darwinian theory that have been overturned or cast into doubt within the last few decades. The collapse of received definitions of homology, the abandonment of the standard causal role of random variation and natural selection, proposals for non-genetic forms of inheritance, radically changing family trees of animal relationships: the 17 science critique chapters of *SPTC* provide an introduction to the evidence. For the *SPTC* authors, these controversies, and the irreversible toll they have taken on the explanatory adequacy of neo-Darwinian theory, provide more than sufficient grounds to abandon evolution in search of something better.

Yet attendees at the November 2016 Royal Society gathering to amend neo-Darwinian theory (including several of the *SPTC* authors) could not have missed the

fact that no intelligent design theorists, from the United States, the United Kingdom, Europe, or Brazil – all locations where ID is actively being developed – were invited to speak. And that fact brings us to the deepest issue: *naturalism*.

“Of course ID people weren’t invited,” the reader may be saying. “They’re not in the right club. Or let’s call it the ‘relevant academic community’ or ‘social context of discourse’ or ‘disciplinary matrix’ or whatever.”

To describe the relevant community – *within* which one may pursue evolutionary theory, even while rejecting core propositions such as UCD or natural selection, yet *outside* of which one is pursuing something else – we will need a definition. C&M provide it in their discussion paper:

We do not and cannot know, as a matter of valid empirical inference, that biological design – meaning the detectable action within space and time of a transcendent intelligence – has occurred.^v

Any such proposition (i.e., the positive inference of divine design as an empirical matter) does not fall within natural science proper. ID theorists by definition say otherwise: design is detectable as an empirical finding. It is a near-certitude that the Royal Society meeting organizers, to a person, agree with C&M. Whatever else one wants to call it, therefore, ID is not science. So no one should be surprised that, from 7 to 9 November 2016, the speaker’s podium in London lacked even one ID theorist.

C&M affirm that we may know design in all sorts of other ways, and indeed say that their understanding of “mere theistic evolution” does not require methodological naturalism (MN). But one can hold to a requirement in practice even while not affirming it explicitly. Nothing in C&M’s paper indicates that they think biological design is empirically detectable. This is MN in practice, if not in name.

Venn diagrams clarify reasoning. Figure 4 below illustrates the regulative role of naturalism (methodological or otherwise) in setting the boundaries of discourse for “evolution,” such that ID falls outside those boundaries. Several of the circles within the domain of naturalism were represented on the podium at the Royal Society meeting, and later such gatherings, such as the April 2019 Evolution Evolving conference at Cambridge University. Each of the circles finds regular publication in mainstream biology journals. These ideas, whether one endorses them or not, represent “science” in 2019.

^v C&M don’t say this, at least not as plainly as I have. They don’t have to, however. The whole thrust of their argument presupposes the point. If we know biological design, C&M consistently argue, we know it via means or methods other than inference from biological observation. If my blunt formulation does not fit with C&M’s understanding of “mere theistic evolution,” I invite correction.

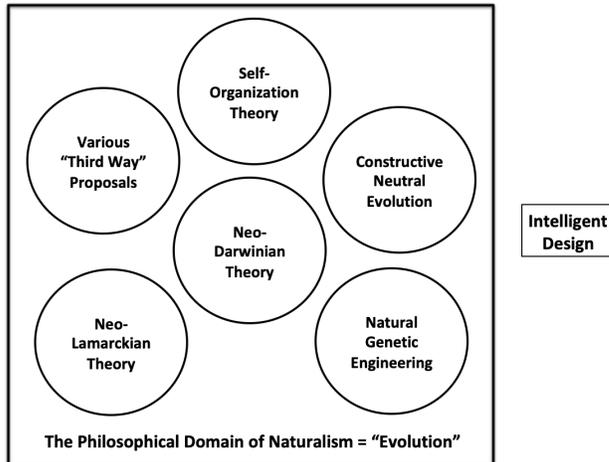


Figure 4. Alternative evolutionary theories within the domain of naturalism; ID lies outside the same domain.

Now what makes Figure 4 particularly poignant is theistic evolution itself. I did not supply a circle, or a box, for theistic evolution, because I want to ask C&M where they would place it. The reader should try the same thought experiment.

Why were no theistic evolutionists advocating for that idea on the podium at the Royal Society? Why were no theistic evolutionists speaking up for theistic evolution at the April 2019 Evolution Evolving meeting at Cambridge University? (At least one was a plenary speaker and served on the program committee, but this person did not defend or explain theistic evolution in their lecture.) Why will no mainstream biology journal publish a primary research paper defending or articulating theistic evolution? Why do theistic evolutionists, on their CVs, carefully distinguish (i.e., list separately) their science publications from their publications about theistic evolution? Why could no biology graduate student, at any major university, win approval for a doctoral dissertation proposal exploring theistic evolution as a biological theory?

Here is why:

We do not and cannot know, as a matter of valid empirical inference, that biological design – meaning the detectable action within space and time of a transcendent intelligence – has occurred.

Remove “theistic” from “theistic evolution,” and you can climb inside the box. Attach that adjective, however, and give it any detectable content of its own – out of the box you go. Evolution survives, despite its radically changing form as a scientific

theory, because naturalism sets the boundaries. This is not, and never has been, a difficult puzzle.^{vi}

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^{vi} A sizable philosophical literature exists on the regulative role of what Harold Brown (1979, 105) calls “paradigmatic propositions.” Naturalism as I have defined it plays just such a boundary-setting role in the debates over theistic evolution and ID. The naturalistic dictum is not something we have learned from observation, but rather determines *what will count* as an observation, a known cause, an explanation, or a valid inference. “[S]uch propositions,” writes Brown, “are not ordinary empirical propositions, exactly because they are protected from straightforward empirical refutation. I will borrow a term from Kuhn and refer to propositions which express presuppositions and which are neither analytic, nor empirical in the usual sense, nor eternal truths, as *paradigmatic propositions*. They constitute an epistemically distinct class in that they do not fit the traditional division of all proposition[s] into *a priori* and empirical. Rather, they are propositions which are accepted as a result of scientific experience but which come to have a constitutive role in the structure of scientific thought. At various times propositions such as that all celestial motions are circular, that physical space is Euclidean, that every event has a cause, or the entire panoply of modern conservation principles has achieved this status.”

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Appendix

Below are exact reproductions from *SPTC* of the relevant sections of chapter 12, “Five Questions Everyone Should Ask About Common Descent,” where the distinction between the theory of universal common descent (UCD) and “evolution” itself is made explicit.

From the Introduction, page 407:

Before we consider the five questions, however, we should clear away some potential misunderstandings about the relationship between the concepts of “evolution,” “common descent,” “materialism” (or “naturalism”), and “intelligent design”:

- **The terms “evolution” and “common descent” do not name the same idea.** When Darwin built his case for UCD in the *Origin of Species* (1859), “evolution”—meaning theories about the origin by natural processes of new groups of organisms—had already been in the air for many decades. Darwin’s own grandfather Erasmus (1731–1802) speculated about the idea, and during the *Beagle* voyage (1831–1836), Darwin had absorbed Charles Lyell’s critique of French zoologist Jean Baptiste de Lamarck’s (1744–1829) theory of evolution. Thus, refuting UCD does not necessarily refute “evolution,” because the latter idea allows for much more than common descent or shared ancestry.
- **The philosophies of materialism and naturalism do not entail UCD; for that reason, falsifying UCD would not necessarily threaten those worldviews.** Lamarck, for example, was a materialist with respect to biology, but he described evolution as occurring in multiple independent lineages, each spontaneously generated. Such a process yields separate trees of life, not a single tree (see Fig. 12.1).⁵ The German materialist and embryologist Ernst Haeckel (1834–1919) also thought spontaneous generation occurred throughout the history of life. Hence, the single-celled organisms alive today did not descend from ancient cells, but originated recently, arising directly from nonliving materials.⁶ Again, such an evolutionary scenario will generate multiple independent trees. Lastly, nearly all evolutionists who currently doubt UCD accept naturalism or materialism as their philosophy of science. Thus, falsifying UCD would not by itself threaten those philosophies.

From the Introduction, page 408:

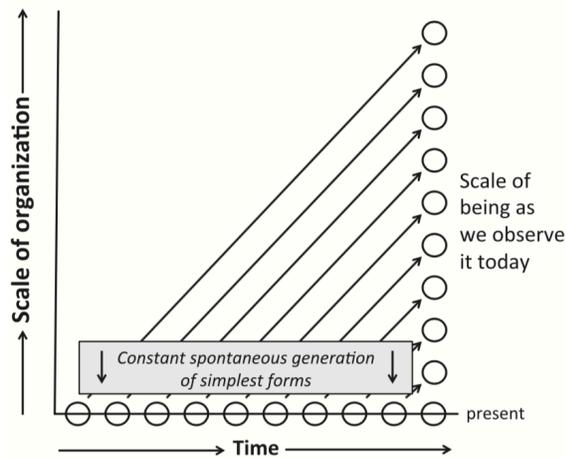


FIGURE 12.1. Following Peter Bowler (adapted by permission; see note 5), the figure shows one interpretation of the evolutionary ideas of Jean Baptiste de Lamarck. At the bottom, simple forms of life arise spontaneously as independent events, and then evolve into more complex forms along parallel lines of progressive change. Even though modification of species is continuous, all living things do not share a common ancestor.

From the Introduction, page 410:

	LUCA existed / Tree of Life	LUCA did not exist / no Tree of Life
No design	Charles Darwin (1809-1882) Ernst Mayr (1904-2005) Richard Lewontin (1929-) Richard Dawkins (1941-) Stephen Jay Gould (1942-2002) Jerry Coyne (1949-)	Jean Baptiste de Lamarck (1744-1829) Lev Berg (1876-1950) Gerald Kerkut (1927-2004) Carl Woese (1928-2012) W. Ford Doolittle (1941-) Didier Raoult (1952-)
Design	Asa Gray (1810-1887) Alfred Wallace (1823-1913) George Wright (1838-1921) Pierre Teilhard de Chardin (1881-1955) Michael Denton (1943-) Michael Behe (1952-)	Carl Linnaeus (1707-1778) Georges Cuvier (1769-1832) Louis Agassiz (1807-1873) Jonathan Wells (1942-) John Sanford (1950-) Günter Bechly (1963-)

TABLE 12.1. Matrix of opinion showing natural historians and biologists holding the four possible positions concerning universal common descent (UCD) and intelligent design. Left upper quadrant: the last universal common ancestor (LUCA) existed at the root of a single tree of life (TOL), and no intelligent design (ID) occurred. Right upper quadrant: LUCA did not exist, and no ID occurred. Left lower quadrant: LUCA and TOL existed and ID occurred. Right lower quadrant: LUCA and TOL did not exist and ID occurred.