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Darwinian evolution is a brilliant and beautiful scientific theory. Once it was a daring guess. Today it is basic to the credo that defines the modern worldview. Accepting the theory as settled truth—no more subject to debate than the earth being round or the sky blue or force being mass times acceleration—certifies that you are devoutly orthodox in your scientific views; which in turn is an essential first step towards being taken seriously in any part of modern intellectual life. But what if Darwin was wrong?

Like so many others, I grew up with Darwin’s theory, and had always believed it was true. I had heard doubts over the years from well-informed, sometimes brilliant people, but I had my hands full cultivating my garden, and it was easier to let biology take care of itself. But in recent years, reading and discussion have shut that road down for good.

This is sad. It is no victory of any sort for religion. It is a defeat for human ingenuity. It means one less beautiful idea in our world, and one more hugely difficult and important problem back on mankind’s to-do list. But we each need to make our peace with the facts, and not try to make life on earth simpler than it really is.

Charles Darwin explained monumental change by making one basic assumption—all life-forms descend from a common ancestor—and adding two simple processes anyone can understand: random, heritable variation and natural selection. Out of these simple ingredients, conceived to be operating blindly over hundreds of millions of years, he conjured up change that seems like the deliberate unfolding of a grand plan, designed and carried out with superhuman genius. Could nature really have pulled out of its hat the invention of life, of increasingly sophisticated life-forms and, ultimately, the unique-in-the-cosmos (so far as we know) human mind—given no strategy but trial and error? The mindless accumulation of small changes? It is an astounding idea. Yet Darwin’s brilliant and lovely theory explains how it could have happened.

Its beauty is important. Beauty is often a telltale sign of truth. Beauty is our guide to the intellectual universe—walking beside us through the uncharted wilderness, pointing us in the right direction, keeping us on track—most of the time.

Demolishing a Worldview

There’s no reason to doubt that Darwin successfully explained the small adjustments by which an organism adapts to local circumstances: changes to fur density or wing style or beak shape. Yet there are many reasons to doubt whether he can answer the hard questions and explain the big picture—not the fine-tuning of existing species but the emergence of new ones. The origin of species is exactly what Darwin cannot explain.

Stephen Meyer’s thoughtful and meticulous Darwin’s Doubt (2013) convinced me that Darwin has failed. He cannot answer the big question. Two other books are also essential: The Deniable Darwin and Other Essays (2009), by David Berlinski, and Debating Darwin’s Doubt (2015), an anthology edited by David Klinghoffer, which collects some of the arguments Meyer’s book stirred up. These three form a fateful battle group that most people would rather ignore. Bringing to bear the work of many dozen scientists over many decades, Meyer, who after a stint as a geophysicist in Dallas earned a Ph.D. in History and Philosophy of Science from Cambridge and now directs the Discovery Institute’s Center for Science and Culture, disassembles the theory of evolution piece by piece. Darwin’s Doubt is one of the most important books in a generation. Few open-minded people will finish it with their faith in Darwin intact.

Meyer doesn’t only demolish Darwin; he defends a replacement theory, intelligent design (I.D.). Although I can’t accept intelligent design as Meyer presents it, he does show that it is a plain case of the emperor’s new clothes: it says aloud what anyone who ponders biology must think, at some point, while sifting possible answers to hard questions. Intelligent design as Meyer explains it never uses religious arguments, draws religious conclusions, or refers to religion in any way. It does underline an obvious but important truth: Darwin’s
mission was exactly to explain the flagrant appearance of design in nature.

The religion is all on the other side. Meyer and other proponents of I.D. are the dispassionate intellectuals making orderly scientific arguments. Some I.D.-haters have shown themselves willing to use any argument—fair or not, true or not, ad hominem or not—to keep this dangerous idea locked in a box forever. They remind us of the extent to which Darwinism is no longer just a scientific theory but the basis of a worldview, and an emergency replacement religion for the many troubled souls who need one.

As for Biblical religion, it forces its way into the discussion although Meyer didn’t invite it, and neither did Darwin. Some have always been bothered by the harm Darwin is said to have done religion. His theory has been thought by some naïfs (fundamentalists as well as intellectuals) to have shown or alleged that the Bible is wrong, and Judeo-Christian religion bunk. But this view assumes a childish primitive reading of Scripture. Anyone can see that there are two different creation stories in Genesis, one based on seven days, the other on the Garden of Eden. When the Bible gives us two different versions of one story, it stands to reason that the facts on which they disagree are without basic religious significance. The facts on which they agree are the ones that matter: God created the universe, and put man there for a reason. Darwin has nothing to say on these or any other key religious issues.

Fundamentalists and intellectuals might go on arguing these things forever. But normal people will want to come to grips with Meyer and the downfall of a beautiful idea. I will mention several of his arguments, one of them (just a bit of) detail. This is one of the most important intellectual issues of modern times, and every thinking person has the right and duty to judge for himself.

Looking for Evidence

Darwin himself had reservations about his theory, shared by some of the most important biologists of his time. And the problems that worried him have only grown more substantial over the decades. In the famous “Cambrian explosion” of around half a billion years ago, a striking variety of new organisms—including the first-ever animals—pop up suddenly in the fossil record as a whole lacked the upward-branching structure Darwin predicted.

The trunk was supposed to branch into many different species, each species giving rise to many genera, and towards the top of the tree you would find so much diversity that you could distinguish separate phyla—the large divisions (sponges, mollusks, chordates, and so on) that comprise the kingdoms of Animals, Plants, and several others—take your pick. But, as Berlinski points out, the fossil record shows the opposite: “representatives of separate phyla appearing first followed by lower-level diversification on those basic themes.” In general, “most species enter the evolutionary order fully formed and then depart unchanged.”

The incremental development of new species is largely not there. Those missing pre-Cambrian organisms have still not turned up. (Although fossils are subject to interpretation, and some biologists place pre-Cambrian life-forms closer than others to the new-fangled Cambrian creatures.)

Some researchers have guessed that those missing Precambrian precursors were too small or too soft-bodied to have made good fossils. Meyer notes that fossil traces of ancient bacteria and single-celled algae have been discovered: smallness per se doesn’t mean that an organism can’t leave fossil traces—although the existence of fossils depends on the surroundings in which the organism lived, and the history of the relevant rock during the ages since it died. The story is similar for soft-bodied organisms. Hard-bodied forms are more likely to be fossilized than soft-bodied ones, but many fossils of soft-bodied organisms and body parts do exist. Precambrian fossil deposits have been discovered in which tiny, soft-bodied embryo sponges are preserved—but no predecessors to the celebrity organisms of the Cambrian explosion.

This sort of negative evidence can’t ever be conclusive. But the ever-expanding fossil archives don’t look good for Darwin, who made clear and concrete predictions that have (so far) been falsified—according to many reputable paleontologists, anyway. When does the clock run out on those predictions? Never. But any thoughtful person must ask himself whether scientists today are looking for evidence that bears on Darwin, or looking to explain away evidence that contradicts him. There are some of each. Scientists are only human, and their thinking (like everyone else’s) is colored by emotion.

The Advent of Molecular Biology

Darwin’s main problem, however, is molecular biology. There was no such thing in his own time. We now see from inside what he could only see from outside, as if he had developed a theory of mobile phone evolution without knowing that there were computers and software inside or what the digital revolution was all about. Under the circumstances, he did brilliantly.

Biology in his time was for naturalists, not laboratory scientists. Doctor Dolittle was a...
We all know that variation occurs naturally. Would be more likely than normal sheep to live long enough to mate, and pass on its superior trait to the next generation. Over millions of years, small good-for-survival variations accumulate, and eventually (says Darwin) you have a brand new species. The same mechanism naturally favors genes that are right for the local environment—warm wool in Scotland, light and comfortable wool for the tropics, other varieties for mountains and deserts. Thus one species (your standard sheep) might eventually become four specialized ones. And thus new species should develop from old in the upward-branching tree pattern Darwin described.

The advent of molecular biology made it possible to transform Darwinism into Neo-Darwinism. The new version explains (it doesn’t merely cite) natural variation, as the consequence of random change or mutation, to the genetic information within cells that deal with reproduction. Those cells can pass genetic change onward to the next generation, thus changing—potentially—the future of the species and not just one individual’s career.

The engine that powers Neo-Darwinian evolution is pure chance and lots of time. By filling in the details of cellular life, molecular biology makes it possible to estimate the power of that simple mechanism. But what does generating new forms of life entail? Many biologists agree that generating a new shape of protein is the essence of it. Only if Neo-Darwinian evolution is creative enough to do that is it capable of creating new life-forms and pushing evolution forward.

Proteins are the special ops forces (or maybe the Marines) of living cells, except that they are common instead of rare; they do all the heavy lifting, all the tricky and critical assignments, in a dazzling range of roles. Proteins called enzymes catalyze all sorts of reactions and drive cellular metabolism. Other proteins (such as collagen) give cells shape and structure, like tent poles but in far more shapes. Nerve function, muscle function, and photosynthesis are all driven by proteins. And in doing these jobs and many others, the actual, 3-D shape of the protein molecule is important.

So, is the simple neo-Darwinian mechanism up to this task? Are random mutation plus natural selection sufficient to create new protein shapes?

Mutations

How to make proteins is our first question. Proteins are chains: linear sequences of atom-groups, each bonded to the next. A protein molecule is based on a chain of amino acids; 150 elements is a “modest-sized” chain; the average is 250. Each link is chosen, ordinarily, from one of 20 amino acids. A chain of amino acids is a polypeptide—“peptide” being the type of chemical bond that joins one amino acid to the next. But this chain is only the starting point: chemical forces among the links make parts of the chain twist themselves into helices; others straighten out, and then, sometimes, jackknife repeatedly, like a carpenter’s rule, into flat sheets. Then the whole assemblage folds itself up like a complex sheet of origami paper. And the actual 3-D shape of the resulting molecule is (as I have said) important.

Imagine a 150-element protein as a chain of 150 beads, each bead chosen from 20 varieties. But: only certain chains will work. Only certain bead combinations will form themselves into stable, useful, well-shaped proteins.

So how hard is it to build a useful, well-shaped protein? Can you throw a bunch of amino acids together and assume that you will get something good? Or must you choose each element of the chain with painstaking care? It happens to be very hard to choose the right beads.

Inventing a new protein means inventing a new gene. (Enter, finally, genes, DNA etc., with suitable fanfare.) Genes spell out the
Nucleotides are the main source of new genes. If you think of a valid gene as a set of nucleotides, you can mutate it to create a new gene. Each nucleotide can be mutated to a different nucleotide, or a stretch of gibberish. Mutations can occur in any part of the DNA, but they are most likely to occur in the coding regions of genes. Mutations can be passed on to the next generation, where they can be further mutated. Mutations can be beneficial or detrimental, and they can lead to new adaptations or new genes. Mutations can also lead to new amino acids, which can be incorporated into new proteins. In fact, mutations are the primary source of new proteins.

Mutations are random events, and they occur at a low frequency. The probability of a mutation occurring is about 1 in 10,000. If you have a long DNA sequence, the probability of a mutation occurring in any one nucleotide is about 1 in 10,000. However, if you have a short DNA sequence, the probability of a mutation occurring is much higher. In fact, if you have a very short DNA sequence, the probability of a mutation occurring is almost certain.

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Neo-Darwinianism says that nature simply rolls the dice, and if something useful emerges, great. Otherwise, try again. But useful sequences are so giganticly rare that this answer simply won’t work. Studies of the sort Meyer discusses show that Neo-Darwinism is the quintessence of a bad bet.

The Great Darwinian Paradox

There are many other problems besides proteins. One of the most basic, and the last I’ll mention here, calls into question the whole idea of gene mutations driving macro-evolution—the emergence of new forms of organism, versus mere variation on existing forms.

To help create a brand new form of organism, a mutation must affect a gene that does its job early and controls the expression of other genes that come into play later on as the organism grows. But mutations to these early-acting “strategic” genes, which create the big body-plan changes required by macro-evolution, seem to be invariably fatal. They kill off the organism long before it can reproduce. This is common sense. Severely deformed creatures don’t ever seem fated to lead the way to glorious new forms of life. Instead, they die young.

Evidently there are a total of no examples in the literature of mutations that affect early development and the body plan as a whole and are not fatal. The German geneticists Christiane Nüsslein-Volhard and Eric Wieschaus won the Nobel Prize in 1995 for the “Heidelberg screen,” an exhaustive investigation of every observable or inducible mutation of Drosophila melanogaster (the same patient, long-suffering fruit fly I muddled with relentlessly in an undergraduate genetics lab in the 1970s). “[W]e think we’ve hit all the genes required to specify the body plan of Drosophila,” said Wieschaus in answering a question after a talk. Not one, he continued, is “promising as raw materials for macroevolution” because mutations in them all killed off the fly long before it could mate. If an exhaustive search rules out every last plausible gene as a candidate for large-scale Drosophila evolution, where does that leave Darwin? Wieschaus continues: “What are—or what would be—the right mutations for major evolutionary change? And we don’t know the answer to that.”

There is a general principle here, similar to the earlier principle that the number of useless polypeptides crushes the number of useful ones. The Georgia Tech geneticist John F. McDonald calls this one a “great Darwinian paradox.” Meyer explains: “genes that are obviously variable within natural populations seem to affect only minor aspects of form and function—while those genes that govern major changes, the very stuff of macroevolution, apparently do not vary or vary only to the detriment of the organism.” The philosopher of biology Paul Nelson summarizes the body-plan problem:

Darwin would easily have understood that minor mutations are common but can’t create significant evolutionary change; major mutations are rare and fatal.

It can hardly be surprising that the revolution in biological knowledge over the last half-century should call for a new understanding of the origin of species.

Darwin’s Limits

Intelligent design, as Meyer describes it, is a simple and direct response to a specific event, the Cambrian explosion. The theory suggests that an intelligent cause intervened to create this extraordinary outburst. By “intelligent” Meyer understands “conscious”; the theory suggests nothing more about the designer. But where is the evidence? To Meyer and other proponents, that is like asking—after you have come across a tree that is split vertically down the center and half burnt up—but where is the evidence of a lightning strike? The exceptional intricacy of living things, and their elaborate mechanisms for fitting precisely into their natural surroundings, seemed to cry out for an intelligent designer long before molecular biology and biochemistry. Darwin’s theory, after all, is an attempt to explain “design without a designer,” according to evolutionary biologist Francisco Ayala. An intelligent designer might seem more necessary than ever now that we understand so much cellular biology, and the impossibly long odds facing any attempt to design proteins by chance, or assemble the regulatory mechanisms that control the life cycle of a cell. Meyer doesn’t reject Darwinian evolution. He only rejects it as a sufficient theory of life as we know it. He’s made a painstaking investigation of Darwin’s theory and has rejected...
it for many good reasons that he has carefully explained. He didn’t rush to embrace intelligent design. Just the opposite. But the explosion of detailed, precise information that was necessary to build the brand-new Cambrian organisms, and the fact that the information was encoded, represented symbolically, in DNA nucleotides, suggests to Meyer that an intelligent designer must have been responsible. “Our uniform experience of cause and effect shows that intelligent design is the only known cause of the origin of large amounts of functionally specified digital information,” he writes. (“Digital” is confusing here; it only means information represented by a sequence of symbols.)

Was the Cambrian Explosion unique in some absolute sense, or was it the extreme endpoint of a spectrum? After all, there were infusions of new genetic information before and after. Meyer himself writes that “the sudden appearance of the Cambrian animals was merely the most outstanding instance of a pattern of discontinuity that extends throughout the geologic column.”

It’s not easy to decide whether something stands alone or at the far end of some spectrum. Consider Meyer’s “functionally specified digital information.” Information intended for one specific purpose and spelled out in a sequence of symbols is a rare bird in nature. It’s an outlier in the world of intelligence, too. We nearly always communicate in symbols that are used for many purposes; it’s hard for us to confine any symbol system to a single purpose. Even digits are used to represent numbers of many kinds, to express order as well as magnitude, as names (2001: A Space Odyssey) or parts of English phrases (“second rate”). A line of music can be heard in the head, hummed or sung, played on a zither or performed by a large orchestra. Or it can serve as a single graphic symbol meaning “music.” But the genetic code is used to specify the structure of certain molecules only (albeit in a series of separate steps and information-transfers within the cell). Nature, for its part, encodes information in many ways: airborne scents are important to bees, butterflies, elephants seeking to mate, birds avoiding trouble, and untold other creatures. The scent is a symbol; it’s not the scent that threatens the bird. Channels in sand dunes encode information about the passing breezes—and so on. There are endless examples—none approaching the sophistication and complexity of DNA coding.

If Meyer were invoking a single intervention by an intelligent designer at the invention of life, or of consciousness, or rationality, or self-aware consciousness, the idea might seem more natural. But then we still haven’t explained the Cambrian explosion. An intelligent designer who interferes repeatedly, on the other hand, poses an even harder problem of explaining why he chose to act when he did. Such a cause would necessarily have some sense of the big picture of life on earth. What was his strategy? How did he manage to back himself into so many corners, wasting energy on so many doomed organisms? Granted, they might each have contributed genes to our common stockpile—but could hardly have done so in the most efficient way. What was his purpose? And why did he do such an awfully slipshod job? Why are we so disease prone, heartbreak prone, and so on? An intelligent designer makes perfect sense in the abstract. The real challenge is how to fit this designer into life as we know it. Intelligent design might well be the ultimate answer. But as a theory, it would seem to have a long way to go.

A Final Challenge

I might, myself, expect to find the answer in a phenomenon that acts as if it were a new and (thus far) unknown force or field associated with consciousness. I’d expect complex biochemistry to be consistently biased in the direction that leads closer to consciousness, as gravitation biases motion towards massive objects. I have no evidence for this idea. It’s just the way biology seems to work.

Although Stephen Meyer’s book is a landmark in the intellectual history of Darwinism, the theory will be with us for a long time, exerting enormous cultural force. Darwin is no Newton. Newton’s physics survived Einstein and will always survive, because it explains the cases that dominate all of space-time except for the extreme ends of the spectrum, at the very smallest and largest scales. It’s just these most important cases, the ones we see all around us, that Darwin cannot explain. Yet his theory does explain cases of real significance. And Darwin’s intellectual daring will always be inspiring. The man will always be admired.

He now poses a final challenge. Whether biology will rise to this last one as well as it did to the first, when his theory upset every apple cart, remains to be seen. How cleanly and quickly can the field get over Darwin, and move on—with due allowance for every Darwinist’s having to study all the evidence for himself? There is one of most important questions facing science in the 21st century.

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