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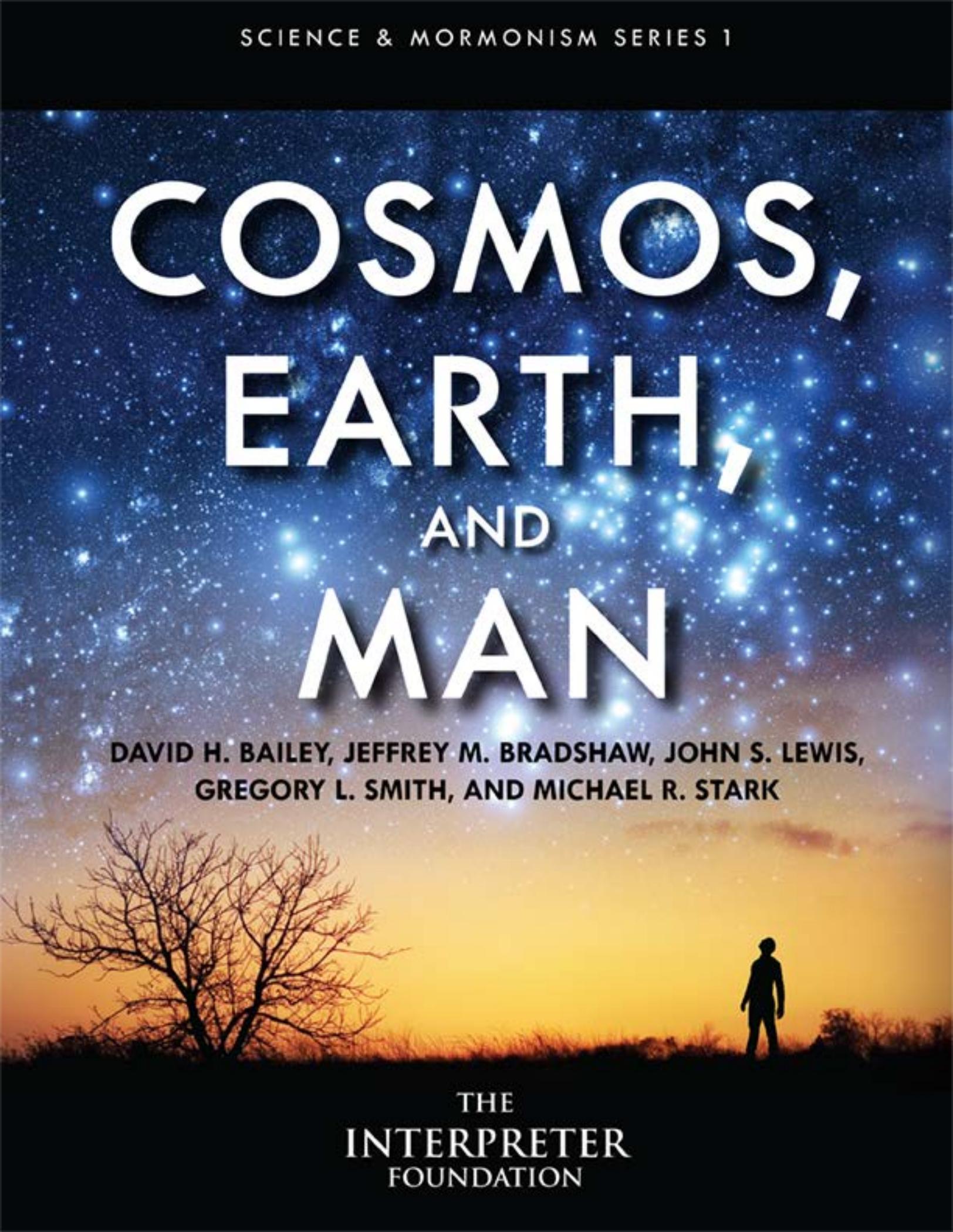
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SCIENCE & MORMONISM SERIES 1

COSMOS, EARTH, AND MAN

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UNDERSTANDING EVOLUTION: AN LDS SCIENTIFIC PERSPECTIVE

Steven L. Peck

*What the hammer? what the chain?
In what furnace was thy brain?
What the anvil? what dread grasp
Dare its deadly terrors clasp?*

William Blake, *The Tiger*

Out of the heat of a rift valley spring, I walked into the dim cool of the National Museum of Ethiopia in Addis Ababa. I came to see the bones of Lucy, a long extinct species of hominin¹ which had been unearthed from the nearby Awash Valley. I was in West Africa with a colleague from the United Nations in Vienna to observe efforts in tsetse fly eradication. I had already visited the “fly factory” where hundreds of thousands of the sterile, male, blood-sucking flies were being reared in chambers. These sterile males would be released into the wild so that there would be no viable males with which the females could mate. Humans come up with the darnedest things.

It was, however, a free day, and there was nothing I wanted to see more in Ethiopia than the bones of my distant ancestor of the species *Australopithecus afarensis*. A guide named Berhane agreed to take me around the city and show me the sights, especially Lucy. I could not be sure that Lucy was a direct ancestor — I might have been descended from her sister or her cousin’s brother-in-law’s best friend’s auntie, but I was pretty sure her species probably gave rise to mine. It was an exciting moment. Since I had arrived at BYU as a fresh-faced, junior faculty member, I had studied and taught about this little bipedal ape who lived 3.2 million years ago. I approached the display case reverently, although my heart was making such a racket, I expected at any moment someone to shush me. Suddenly there she was: The three-foot incomplete skeleton laid out in a glass case, in a dimmer than expected light. Nevertheless it seemed to give off an almost holy glow. I thought about the ages that separated this grandmother and me. As I looked at the bones, a profound

sense of deep genealogy — even the spirit of Elijah — seemed to swell my heart. I felt a great sense of honor and privilege to behold these fossils with my natural eyes. It was a solemn and profound occasion, one I knew I would always remember and honor.

I looked at Berhane and said, “I can’t believe that I am seeing the actual bones of Lucy. I’ve wanted to see these since I was an undergraduate.”

Berhane looked a little awkwardly at me and said, “Well, you know these aren’t the real bones, right?”

“What?”

“The real bones are on display in Texas right now. These are replicas.”

Replicas like the ones we used in teaching at BYU.



Figure 1: *The “Bones” of Lucy*

That our bodies are descended from apes is scientifically beyond dispute. I find great comfort in this. We have evolved. Our ancestors emerged from Lucy or something like her. Our physical genealogy has a rich heritage, passing through primitive, worm-like ancestors, through bony fish, to thick-bodied amphibians, to therapsid reptiles, on to ratty mammals, to primates, apes, and finally a kind of ape that started increasing in cunning, in intelligence, in its ability to run and throw, and in its capacity to reason and use language. And to build a wondrously complex material culture.

The scientific evidence for evolution is overwhelmingly clear. One would have to claim that science is largely uninformative as a way of knowing truth to hold onto the claim that evolution has not been established scientifically. If you don’t believe in evolution, you don’t believe in science. It is that simple.

I have had no problem reconciling my religion with evolution and have come to believe that that the scientific story of our origins offers insights into our faith that are not only important but vital to its mature expression. In the past, some Church

leaders have believed in evolution whereas others have vehemently denied it. For example, in 1954, before the many important scientific findings of the last sixty years had been made, Elder Joseph Fielding Smith wrote:²

This brings us to the discussion of what I believe to be the most pernicious doctrine ever entering the mind of man: The theory that man evolved from the lower forms of life. For its source we must go beyond the activities and research of mortal man to the author of evil, who has been an enemy of truth from the beginning before the Earth was formed.

I believe that President Dieter F. Uchtdorf had statements such as these in mind when he said in 2013: “[T]o be perfectly frank, there have been times when members or leaders in the Church have simply made mistakes.”³ Decades after Elder Smith’s statement was published, Evenson and Jeffrey⁴ assembled a valuable, up-to-date collection of authoritative statements on evolution made by leaders of the Church. A study of these statements will reveal that the Church has never had an official stance on organic evolution.

It should be noted that the first formal class in evolution was instituted at BYU in the fall of 1971 with the First Presidency’s approval, and the study of evolution is a required part of the core curriculum of all BYU students in the biological sciences. Evolutionary biology has become one of the largest and most successful graduate programs at BYU. Neither Creationism nor Intelligent Design is taught there.

In this chapter, I will not try to harmonize opposing views on evolution. I take it as axiomatic that evolution in its broad sense is the way the biological world works, although details are still being worked out and amazing discoveries will continue for centuries. Particulars of how it proceeds (such as what role genetics versus epigenetic factors⁵ play in enhancing or retarding evolution) are being argued about and debated among scientists in healthy ways. Progress is ongoing. If you currently have suspicions about the scientific evidence for evolution, a short write-up is unlikely to move you from your position. Rather, I would encourage you to dig in and read a couple of books on the topic from well-respected, mainstream scientists so the full weight of the evidence can give you the best chance of being persuaded. What I do want to do instead in this chapter is to walk you through those aspects of evolutionary theory that seem important to a well-developed Mormon perspective.

Evolution

Darwin’s First Observation: We seem to be a little short on elephants. Where are all the elephants?

To understand evolution we can do no better than to go back to Darwin, who first articulated one of its principal mechanisms, Natural Selection. He observed three things that laid the foundation for his theory. In his magnificent *The Origin of Species* he observes:⁶

There is no exception to the rule that every organic being naturally increases at so high a rate, that if not destroyed the earth would soon be covered by the progeny of a single pair.

To feel the full impact of this observation, I have my students imagine a pair of flies that produce offspring every five days, have an unlimited supply of energy, and don't need males to fertilize their eggs. I ask them to calculate how long it takes to create a ball of flies with the same mass as the planet earth? The answer is only 1.67 years. If you let it run a few more years, pretty soon you have a sphere of flies whose diameter is expanding faster than the speed of light. Life has tremendous reproductive potential. Darwin thinks about it in terms of elephants:⁷



The elephant is reckoned to be the slowest breeder of all known animals, and I have taken some pains to estimate its probable minimum rate of natural increase: it will be under the mark to assume that it breeds when thirty years old, and goes on breeding till ninety years old, bringing forth three pair of young in this interval; if this be so, at the end of the fifth century there would be alive fifteen million elephants, descended from the first pair.

A quick glance at the world, and we find that it is covered with neither flies nor elephants, so something must curtail the potential population growth. It is obvious that unlike the scenarios posited above, real populations need resources to grow: food, shelter, places to live, and for many species, mates. These resources are always limited. This creates the condition with which we are all familiar, one pervasive for all life forms: the struggle for existence. This struggle is ever-present. Things better at managing that struggle than their neighbor are those that survive. They don't

have to be the best, mind you, just better than others. Like the old joke about the two women running from a bear, neither woman has to run faster than a bear, just faster than the other woman.

What determines the winners in this struggle? Small things. Little advantages. Being just a bit more adapted to the environment than those around them. The struggle is so fierce that even small advantages tend to make the difference between surviving long enough to leave offspring or not.

In short, there is a struggle for existence in which there are winners and losers. Those with some advantage tend to win over those without (Not always. Chance plays a role here as well. Sometimes well adapted things can be unlucky, as when the fastest rabbit in the warren just happens to get struck by lightning).

Notice one last thing in the struggle for existence, and this needs to be emphasized: this struggle always takes place in a context, an environment, a location. A place that has particular features to which the organism must respond. This local environment sets the conditions that determine who wins and who loses. Last year's fins were great in the sea, not so good on the beach. And one thing you can count on if you live on earth, these conditions are always changing.

Darwin's Second Observation: Just like snowflakes, no two barnacles are the same.



If we are inclined to picture Darwin at all, we are tempted to visualize him standing seasick on the deck of the HMS Beagle tromping through the pampas of Argentina, or sitting astride a Galapagos tortoise. However, perhaps a more telling portrait could be offered: his wife Emma at home managing a busy nineteenth century household, his kids learning and going about their lessons and chores

while he, up in his study, pores over his collection of barnacles. For ten years he wrote to collectors around the world for specimens of these crustaceans. Then he carefully dissected them, documenting their morphology, their variations, and the minute details of their anatomies. He ended up writing four monographs on barnacles, two on living varieties, and two on fossil species.

This work established Darwin's reputation as a scientist more persuasively than anything else he had done up to that time and would be foundational in his continued pursuit of, as he called it then, "the species problem." His careful and meticulous work helped him realize one of

the most important facets of living things: they vary. Even organisms of the same species show a wide range of variation, and his work on barnacles drove this home with force and clarity.

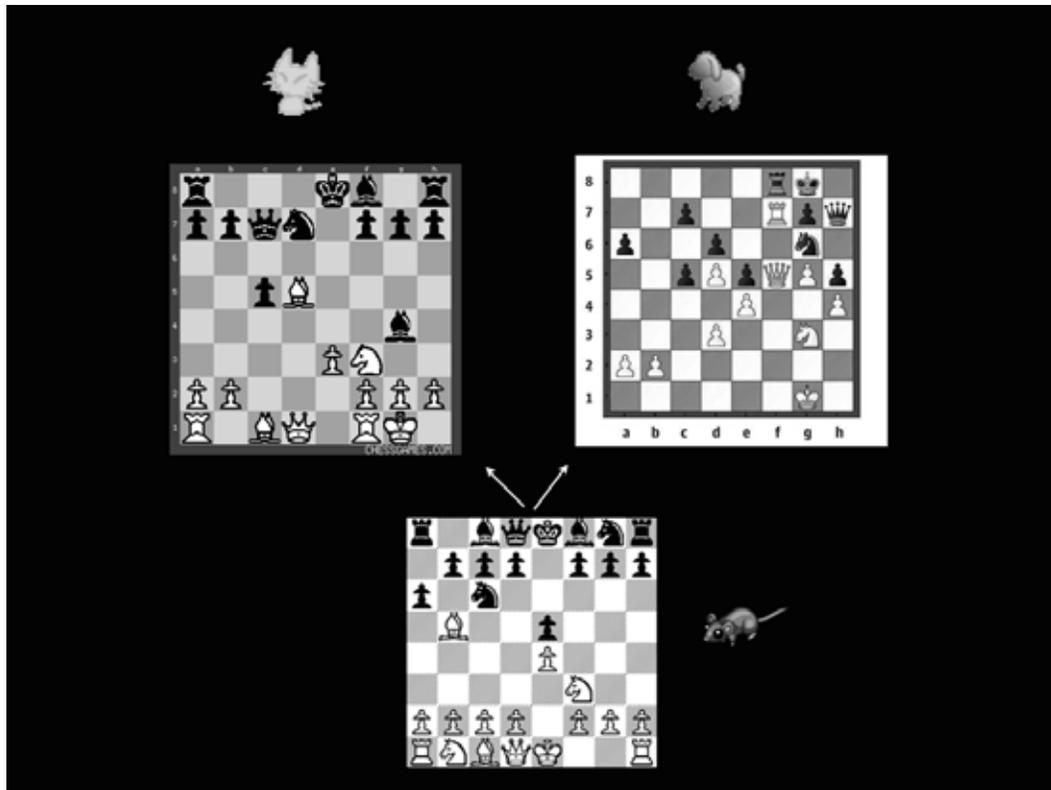
On this variation he realized that speciation did its work. If organisms varied (as with his work on barnacles, he also spent enormous time and expense in writing letters to researchers around the globe, documenting the heterogeneity found in other organisms — everything from pigeons to beetles), then it was on this aspect of populations that the struggle for existence would do its refining work of picking out those variations most adapted to the conditions of their current environment. Over time, this slow process could lead hippo-like creatures to become whales and primitive primates to become humans.

One point here deserves some clarification. Among non-biologists there is a myth that species or “kinds,” as they are often called after the English translation of the Hebrew word designating differences in animals and plants in Genesis, form some sort of barrier over which species cannot cross. As if by making the distinction that different kinds of animals exist, scripture was imposing some sort of immutable law that such distinctions were set in the eternal order of things. This acquired cachet in Christianity’s borrowing from Neo-Platonist ideas on Platonic ideal forms and the great chain of being. If there was an ideal form for each animal, then imagining transitions becomes difficult — is there a form for each transitional type? That seems a little excessive. This was formalized in Natural Theology as the idea of *plenum formarum*, that the creation exhausted all types of possible creatures. All that *were* created are all that *could be* created, and none were not created that could have been. That is what you see in the natural world, all the ideal types there were, and none are missing.



Drawing of “Cat and Dog Spirits”

When I was an undergraduate, I encountered something similar to this mistaken view in my BYU Pearl of Great Price class. My teacher drew on the chalkboard a spirit dog and a spirit cat and declared, “Thus we see that evolution is not true



for there can be no spirit that is a mix of the two.” My first thought was that he obviously has not visited the BYU Bean Museum and looked at Shasta the stuffed Liger, which was a mix of a lion and a tiger (which, as Napoleon Dynamite reminds us, are “powerful in magic”). And second, how did my teacher know there could not be transitional spirits? He had mistaken “spirits” for Plato’s “ideal forms,” mistaking doctrines from Plato for those of Joseph Smith and our faith.

Perhaps I can give a better illustration of how biologists think of species by using the game of chess. What you see in the figure above are chessboards with particular configurations. To reach any of these patterns, you must go through a particular set of steps prescribed by the rules of chess. One question you could ask is, given the two configurations at the top of the figure, is it possible to reach those patterns from the third set of piece positions below? That is, could this third configuration be the ancestor of two later arrangements? In the figure, I’ve labeled one pattern “cat” and another “dog.”

We can ask are those two game configurations possible descendants of the rat game arrangement? Are there a series of moves from rat that will take you to cat? Or dog?

Similarly, a real dog and cat can be thought of as constructed by particular configurations of DNA strands and the machinery associated with their production. So one could ask, is there a series of changes in DNA from a rat-like ancestor to a dog and cat? We know a lot about the rules of the DNA game, moves like mutations,

transcription, chromosomal inversions, and so on. There is no boundary one could mark out suggesting that species can't wander into new regions of DNA's possible configurations, changes that we would designate as species when they've traveled far enough from the ancestral type.

In some ways "species" itself is a fraught concept, and there are ongoing debates in biology if species even exist or rather are a way for humans to designate a certain accumulation of variation that have moved too far to allow species to mate properly. "Kinds" would fare the same. In short, imagining that species cannot cross certain boundaries that keep them as species or kind is without warrant — unless you love Neo-platonism so much, you are unwilling to allow science to make progress without first checking in with Plato and his gang to make sure he's okay with the move.

The source of this variation is mutation in the DNA. As indicated previously it is likely that quantum effects make changes to the nucleotide structure of this molecule. Once the change is made, it becomes a part of the genome forever.

Darwin's Third Observation: Inheritance and family resemblances (so glad the kids take after their mother)

In the classic Mormon musical "Saturday's Warrior," the idea of inheritance is captured in a song in which the cast laments the most defining trait among the family members:

It wouldn't have been so bad
if it had stayed with old dad
but we've all got daddy's nose

That offspring resemble parents is an often overlooked requirement for evolution to work. As Darwin points out:

Any variation that is not inherited is unimportant for us. But the number and diversity of inheritable deviations of structure, both those of slight and those on considerable physiological important, is endless . . . No breeder doubts how strong is the tendency to inheritance; like produces like is his fundamental belief.⁸

From those three observations a simple set of inferences set up the principal ideas of evolution. Let's look at these ideas just a little closer.

What is Evolution? A Law of Nature, or Just a Way to Sort Your Playing Cards?

Suppose someone handed you five random playing cards, and you wanted to sort them in numerical order. What would you do? Why, you would use the Shell Straight Insertion method of course! Which means you take out the i^{th} (1st, 2nd, so on) until you get i^{th} card and place it in order relative to the card next to it. You repeat this until all your cards are in order. It always works. If you follow this procedure,

you will have sorted cards in your hand in no time. If you doubt me, try it. You've probably done it unconsciously if you play cards and you wanted them ordered in your hand.

It always works, not because it is a law but because it's something even more fundamental. It's an *a priori* principle. One can imagine a universe where different laws held, but one cannot imagine a universe where this did not work. This algorithm is based only on the properties of integers and what it means to order them. Like sufficient reason, it underlies logic, not the physical facts of the universe. You can imagine a universe where gravity did not exist, but it would be hard to find one in which $2 + 2$ did not equal 4.

If you do the sorting algorithm, its success is based upon the same coherence principles that structure all logical relationships. Things can go wrong with sorting, certainly, but the problem will be in the application, not in the principles that underlie the algorithm.

Evolution by natural selection is also a sorting algorithm based on similar *a priori* principles. It is not a law of nature. As philosopher, Christian Illies, points out, it is not just a law, it is a deep principle of reason.⁹ Let's be specific. As Darwin pointed out, evolution by natural selection requires three things:

- Variation in traits
- Selection on trait differences (set up by the struggle for existence mentioned above)
- Trait attributes that are inherited by "offspring" from "parents"

I'm using quotes in that last item because this works whether these "offspring" and "parents" are chemicals, digital computer programs, or beans in a jar — anything. That evolution by natural selection works is not really in dispute. It is obviously just a sorting algorithm that sorts things based on some selection criteria like in the card sort used above, usually determined by some environment where the traits vary on how well they reproduce in that environment.

A claim of evolution by natural selection for a population of "whatevers" is simply making the claim that they are just the sort of thing that fits the three criteria above. The algorithm is not in question. Are the biological creatures of the earth the sort of things for which the three criteria hold? That and the specification of an environment are the only empirical facts in question about whether or not life on earth evolves. If organisms on earth meet the three criteria, they will change to better fit their environment. Because environments on earth are always shifting in ways both caused by and in return influence evolution, things on earth evolve. That alone is sufficient to underscore that evolution by natural selection occurs in the natural world. Biologically the answer is a resounding yes. Life on Earth meets all the criteria for this algorithm to work.

Plus we see it in action in populations that evolve on human time scales, such as bacteria and insects becoming resistant to pesticides. We can also infer it by looking at DNA patterns and fossils.

Remember Evolution Is Complex

The last thing I want to do is leave you with the impression that evolution is as simple as running through the simple rules above. While those three things seem to be necessary for evolution to proceed, they are hardly sufficient. There must be ways of using energy to drive the system. There must be structures in place that allow variation and inheritance to continue to exist. The three necessary conditions are not all there is to the story about the rich complexity we find in life on this planet. Recent advances in the fields of developmental biology and ecology have opened a window into the way that genes create feedbacks that affect other genes and even create proteins that can affect their own expression.

Developmental processes are not just genes creating proteins that then simply self-assemble into an organism like pieces of a puzzle or like a thousand monkeys on a thousand typewriters trying to create Shakespeare. Reality is so complex we are just starting to understand it. We can see that it involves emergent processes with things becoming modular and channelized, feedback loops within feedback loops, and monstrously entangled processes flitting into new pockets of design space. Epigenetic effects (effects not under genetic control) play a role; for example, the condition and makeup of a mother's egg can have striking effects on the offspring. Influences of the environment can induce certain changes on the methylation patterns on an individual's DNA that will block or allow the expression of certain genes. The maternal levels of stress or other environmental influences can affect the developing embryo. This is an exciting field that is defining new possibilities for the way that life evolves. However, this complexity does not change the necessary basic processes described above. How important they are and the extent of other influences are still active and dynamic fields of study. But complexity, emergence, chaos, natural selection, and variation are going to continue to play a role. What those roles are will be a rather sticky wicket. The hard questions always are.

What of Intelligent Design? Is That Something Mormons Can Get Behind?

In the late Middle Ages, there was a twisted group of clerics (an entire underworld of them, it turns out) who wanted information from God. They felt the Deity, however, was being a little cagey about dispensing his almighty power and wisdom, so they put on their thinking caps and pondered, "How can we get God's knowledge when he won't tell us any of the really useful info we want to know?" Well, they came up with a creative albeit malevolent solution that didn't even involve God. Ask demons! The Devil's followers know all this great stuff from the preexistent world from which they fell, so why not bind them and constrain them to give up the goods? Demons are subject to the clergy, right? So back in the fifteenth century they wrote a manual on how to use all this dark power to corner the market on the world's



Scholar with Devils. Illustration from *Omne Borum*, 1360-1375, English School, 14th century

beard, and dressed in white in a secret place outside of town, under a clear sky, on level ground, trace a circle such as appears here with a magnificent sword, writing these names and everything shown along with them. When this is done, place the sword toward the west, on ...

Then it goes on with the detailed instructions, gives the names of the demons you must bind and words you must say to constrain them to your will and then, wham, there you have it, a cloak of invisibility. You dismiss the spirits that brought it to you. However, on the third day you have to give back the cloak, or you will be dead in seven days. Nasty business this.

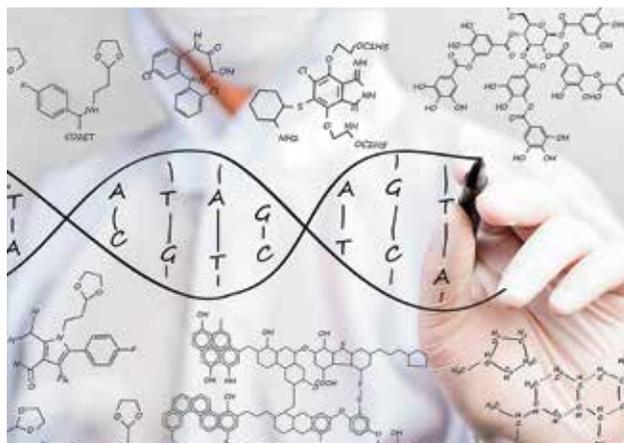
I was thinking about the people who invariably actually tried this. I mean, I am pretty sure they didn't get their cloak of invisibility. But I doubt they realized that their mistake (other than messing with demonic powers, that is) was that they did not have the correct picture of how the world worked. I bet they focused on trying to get the ritual perfected. There are a lot of things that could go wrong with this "experiment" (that's what they really called them [in Latin, of course]). For example, how round does the circle have to be? Are you sure you have a magnificent sword? How true to west? Are you sure your hair was cut properly short? How clear does the sky have to be? What if there is just a little cloud in the sky *way* out there, does it still count as clear? How level is level? I can just see the seeker of the invisibility cloak scratching his head, wondering what he did wrong when his cloak equivalent to the Ring of Gyges doesn't appear.

His hypothesis is probably that there is something wrong with his execution. There is no evidence or fact of the matter that he would likely accept that will convince him that he is just missing something about the way the world really works. He's brought his beliefs about the cloak into the experiment so strongly that he is looking in all the wrong places for what is souring his attempts to score an

secrets.¹⁰ A manuscript found in Munich is full of recipes for all kinds of wacky hidden, forbidden knowledge. For example, say you wanted a cloak of invisibility (and who doesn't, by the way?) all you have to do is:¹¹

When you wish to become invisible and insensible to all beings, both rational and otherwise, first, under a waxing moon on a Wednesday in the first hour of the day, having remained chaste for three days beforehand, and with cut hair and

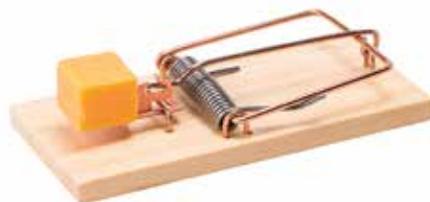
über-cool mantle. Indeed, the poor fellow could even do a certain kind of passé science on his efforts, using the hypothetico-deductive method (if you think this is all there is to science, you are living in the 1920s) — rejecting hypothesis after hypothesis on what went wrong, assuming all the while that getting your invisible cloak is possible; you just have to get the ritual correct. Getting right how the world works, both physically and spiritually, turns out to matter.



Hence the invention of science was such a powerful ally in getting the world right. It brings to bear lots of things on finding out how the world works, including, logic, testing, trial and error, creativity, memory, falsification, confirmation, influence of current theory and paradigms, apprenticeships, refining technique, discussion, argument, going back to

the drawing board, imagination, doubt, belief, asking questions, challenging convention, and, yes it's true, even doing experiments where possible. But its biggest strength, despite well-acknowledged weaknesses, is that it is self-examining and self-correcting. People are in active engagement to find its flaws, reinterpret its findings, and expose its weaknesses. It's a powerful tool. That's why our medicine today is better than that of our grandparents and will likely not be as good as that of our grandchildren.

One can hardly start talking about the underbelly of an evil clerical underworld, though, without the mind being drawn into thinking about the Intelligent Design Movement (ID). The ID movement was started by a group of Christian scientists who thought they discovered a flaw in evolutionary theory. They noticed biological structures that were hard to imagine as having evolved because they consisted of multiple parts that all had to be in place for the object to work. They used the example of the mousetrap that does not work in pieces but must be assembled wholly to work. Because evolution works only on what is present and useful, they argued that such structures required some divine tinkering to get things over the hump. They rightly noticed that a half a mousetrap would have no selective advantage on its way to becoming a working one, and so evolution would fail in its creation. They proposed a number of biological examples they thought had this attribute, like a mousetrap,



which they coined as “irreducible complexity” like the eye or the flagellum of a bacterium.¹² They wanted to make scientific claims about such structures, but every one they proposed was shown to have a natural evolutionary explanation based on gene structure, physiology, and mechanism.

However, their commitment to science turned out to a pretense. In the words of Terrence Deacon, “Politically, ID is a thinly veiled battle by Christian religious fundamentalists to sneak vestiges of biblical creationism or supernaturalism into the educational system.”¹² The Christian judge of the famous Dover trial, in which a group of Christian fundamentalist attempted to teach their version of creationism in the public schools using Intelligent Design, recognized it as a Trojan horse to get someone’s interpretation of religion taught in the classroom. He wrote, “The overwhelming evidence at trial established that ID is a religious view, a mere re-labeling of creationism, and not a scientific theory.”¹³ Intelligent design fails every criterion that demarcates science from pseudo-science, yet it has tremendous appeal because it makes God’s role in creation explicit. It has no research method other than declaring something “irreducibly complex.” In so doing, ID argues that science can no longer investigate that biological phenomenon *because* it is “irreducibly complex.” Thus, it sets arbitrary limits that mandate the ongoing scientific investigation. Isn’t that strange?

Such a sleight of hand is both bad science and bad religion. Sadly, the ID movements seems to have captured an invisibility cloak because for many in the United States, their methods have become “*invisible and insensible to all beings, both rational and otherwise.*” Like the dark clergy mentioned above, they have no interest in understanding the many disciplines that have converged to paint a plausible picture of how the biological world works. Their sole interest is in advancing their simplistic, preconceived views about how they think the biological world *should* work.

The ID movement offers no testable hypotheses, no interpretations of the data in its full complexity, no publications in scientific journals, no explanation of anything beyond what evolution has already explained. Unlike science, it has made made no predictions and has uncovered no significant correspondences among the many disciplines investigating relevant matters. On the other hand, the scientific study of evolution weaves together mutually supportive findings in disciplines as diverse as geology, paleontology, genetics, embryology, anatomy, physiology, neurology, biodiversity, biogeography, agronomy, pharmacology, immunology, epidemiology, neurology, and psychology, and more. Significantly, evolutionary theory also has found practical confirmation in its successful application to problems in computer science, engineering, and mathematics.

Unfortunately, ID arguments have taken on a scientific gloss that has impressed state legislatures across the country. (No big surprise there given what we see from most state legislatures.) However, it is disappointing to see that the ID movement also seems to have been making inroads into the LDS community.¹⁴ Why? Who

knows. Maybe the name sounds like things we just ought to believe. Never mind the content of its claims.

Keep in mind that a firm evolutionary consensus has been increasingly established over many decades using evidence across a wide variety of scientific disciplines. We have to deal with it. We may need to adjust how we think about creation. However, in my view, evolution does not negate by one iota the idea of a purposeful universe that was organized by a loving, intelligent God. Nor does it play havoc with any other of our cherished religious doctrines. Indeed, a vigorous commitment to scientific investigation of evolution — as well as every other aspect of the natural universe — is enjoined specifically in our belief that “truth is knowledge of things as they are, and as they were, and as they are to come” (D&C 93:24).

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Endnotes

1. Hominins are apes that are taxonomically classified in the same tribe as humans. A Hominid is any of the great apes, although in popular writing “hominid” is often used to reference hominins.
2. Smith, 1954, p. 133.
3. Uchtdorf, 2013, p. 322.
4. Evenson & Jeffery, 2005. These and other statements are also included in the final chapter of the current volume.
5. One of the great stories of evolutionary theory in the twenty-first century is that other things than DNA affect evolution, such as developmental factors and the machinery that houses the genetic program.
6. Darwin & Wilson, 2006.
7. Darwin & Wilson, 2006, p. 491.
8. Darwin & Wilson, 2006, p. 457.
9. Illies, 2005.
10. Kieckhefer, 1998.
11. To anticipate some comments from those who think that evolutionary biologists are inherently evil, no, I haven’t tried to conjure up demons to get an invisibility cloak. (Although I did try to sing once to win a fair woman’s heart, but that went as well as trying to get the invisibility cloak did for the Necromancer clerics.)
12. Behe (1996) originally outlined such arguments. Pallen and Matzke (2006) provide a cogent refutation of the claim that the bacterial flagellum cannot evolve.
12. Deacon, 2012, p. 61.
13. Kitzmiller vs. Dover, 2005.
14. See, e.g., E. H. Ecklund, *Religious Communities*, p. 21, where the percentage of Mormons surveyed who said that creationism (i.e., “God created the universe, the Earth, and all of life within the past 10,000 years”) was “definitely true” (37.9%) was second only to the percentage of Evangelical Protestants who said the same (43.3%). The percentages of other religious groups were much lower: Catholic (19.2%), Mainline Protestant (17.7%), “Something Else” (16.9%), Muslims/Hindus/Buddhist/Sikhs/Jains (9.6%), Jews (6.8%), and Atheist/Agnostic/No Religion (2.8%).

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His greatest achievement, however, is he and his wife Lori's four sons and one daughter. He served a mission in the Arkansas Little Rock Mission and currently is the High Priest Instructor for his ward.