Ubiquity of convergence—are evolutionary outcomes inevitable?

Improbable Destinies: Fate, chance, and the future of evolution

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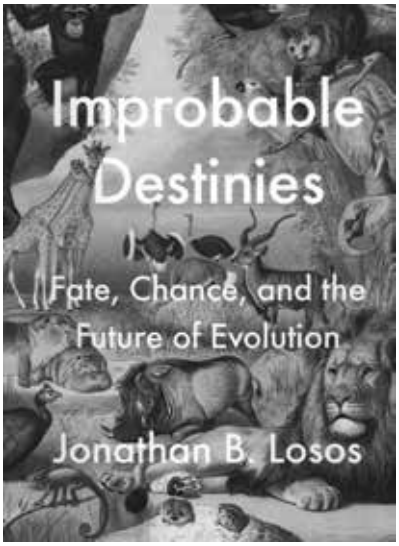

John Woodmorappe

Author Jonathan Losos is Biology Professor and Director of the Losos Laboratory, at Harvard University. He is Curator of Herpetology at Harvard's Museum of Comparative Zoology and he specializes in field experiments on lizards.

This book is a boon for naturalists. It is packed with countless details about plants, invertebrates, and vertebrates. Evolutionary thinking is generally a speculative add-on or afterthought.

This book also describes field experiments on evolution—which really are experiments in variation within the created kind. These enable the creationist scientist to better understand how creatures can rapidly adapt to novel environments, such as must have happened after the Noachian Deluge. For example, one experiment showed that fish can adapt to a 4.5º tolerance to colder waters in only two years (p. 200)!

Modes of convergent evolution

The author believes that convergent evolution is much more common than is usually realized. He discusses many examples and modes of convergence. Permit a few examples.

There are many convincing lookalikes among entire vertebrate animals. As an example, he discusses what happened when Europeans came to Australia. They easily recognized the familiar wrens, warblers, babblers, flycatchers, robins, nuthatches, etc. Many knowledgeable ornithologists made the same deductions. However, genetic studies later showed that the Australian birds are more closely related to each other than they are to their presumed respective European counterparts. In other words, according to evolutionary thinking, the amazing similarities between the Australian avifauna and the European avifauna are the products of convergent evolution.

Of course, convergence does not require an evolutionary explanation. Everyday intelligent-design explanations suffice. For instance, the gasoline-powered lawnmower, though anatomically related to the automobile, is strongly convergent with the battery-powered lawnmower.

Convergence can occur between the most unexpected animals. For instance, Losos, a lizard specialist, claims that a certain African lizard has a placenta-like structure (p. 345).

Convergence can also occur in terms of modular units situated in the bodies of organisms. Consider us humans. We have the bipedality of the theropod dinosaurs, kangaroos, and hopping rodents. We also have reduced hair, as is the case with hippos, pigs, elephants, and the naked mole rat. Our opposable thumbs are found not only in our closely related primates, but also in opossums, koalas, some rodents, and some tree frogs. Finally, our large, forward-facing, binocular eyes occur not only in all primates, but also in many cats, owls, and Asian whip snakes.

Finally, convergence can occur in mosaic fashion. This is so pronounced in the platypus that, when this oddball was first described, it was at first suspected of being a hoax—a made-up animal consisting of an assortment of cut-up parts of various animals (figure 1). Thus, the very-real platypus has the bill of a duck, the webbed feet of an otter, the stout tail of a beaver, the hollow-tubed venom-injecting spine of the rattlesnake tooth, and electroreception capabilities reminiscent of that of the electric eel.

Why was there convergent evolution?

When traits are convergent, especially repeatedly, and in organisms that live under very similar environmental conditions, this is taken as an indicator that natural selection drove the traits to converge. For instance, the fusiform shape of the fish and the dolphin, which are not close evolutionary relatives of each other, is understood in terms of the fact that it is about the only geometry that a body can have that enables it to move effectively in water. Such thinking intuitively makes sense, but

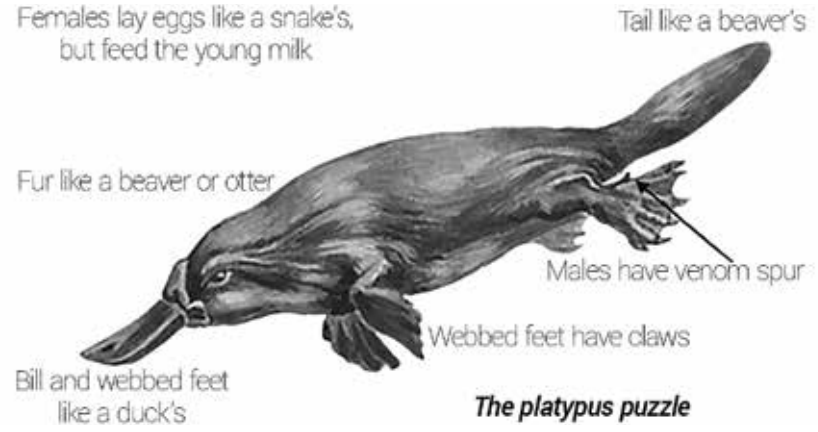

Figure 1. The platypus is an oddball consisting of convergent modular units.

eschews special creation (and common design) as alternative explanations. For instance, the fusiform shape of the aeroplane and the race car exist in order to reduce the drag of air at high speeds, but no one imagines that they are the outcomes of a blind evolutionary process. They are the products of intelligent design.

In many cases, evolutionists must fall back on speculation and adaptationist just-so stories to try to explain why convergent features exist. For instance, many theropod dinosaurs are believed to independently have acquired small forelimbs. The famous *Tyrannosaurus rex* has them, and so does the recently discovered *Gaulicho shinyae*. Losos comments:

> "Scientists have put forward all manner of explanation, one crazier than the next. Maybe the super-predator fed in such a frenzy that its arms evolved to be short so it wouldn't accidently bite them off and feed them. Perhaps the little limbs were used for pushing off the ground to get up after a nap. Possibly, male *T. rex* needed shorter arms to better titillate their mates. Needless to say, none of these ideas has gained support" (p. 100).

Then Losos goes further, warning against adopting *any* adaptationist explanation:

> "Convergent evolution doesn't necessarily prove that a shared trait is the result of natural selection. Maybe *T. rex* and *G. shinyae* both just happened to evolve diminutive forelimbs by chance. If we knew why small limbs with two digits evolved, what advantage they provided, or why natural selection favored them, we would have reason to think that the convergence was adaptive. But absent any data, we can't just assume that natural selection is the cause" (p. 101).

Singularities in nature

The singularity, in a sense, is the opposite of convergence. It is a one-of-a-kind organism. This includes the human, which has no animal counterpart remotely close in intelligence and capabilities. The elephant—with its versatile, specialized nose (the trunk), capable of a diversity of tasks—is another singularity. As another example, the archerfish alone has the capability of directing a shooting stream of water to knock an insect off a plant and into the water.

Are evolutionary outcomes inevitable?

Evolutionists have often speculated on how things would be the same, or different, if evolution was to repeat itself. Were the Cambrian explosion to rerun, would human-like creatures still emerge? Or would we have a world of bizarre, land-dwelling octopuses?

Author Losos takes such speculations to a more sophisticated level. For instance, he focuses on New Zealand, which had no land mammals except bats. Instead, its distinctive flightless birds, such as the kiwi and moa, superficially filled some of the niches taken by mammals elsewhere. From this, he suggests that, had the mammals gone extinct at the end of the Cretaceous along with the dinosaurs, our world would be characterized by a variety of flightless birds.

As for the question of human reappearance, he charts the course of primate evolution. In Madagascar, the lemurs underwent a distinctive adaptive radiation, but nothing emerged that remotely resembled a lemur counterpart to the human. Another distinctive primate adaptive radiation—in South America—consisting of various monkeys and marmosets, also failed to produce anything even suggestively humanesque. From this, Losos concludes that humans were likely the result of evolutionary contingencies (that is, chance events that radically shaped subsequent evolutionary outcomes (p. 302)). For this reason, it is very unlikely that humans would 'repeat' under any 'replay' of organic evolution.

Is evolution science?

In the past, creationists (for example, the immortal Duane T. Gish) had suggested that molecules-to-man evolution, strictly speaking, is not science, as it deals with past, non-observable events, and is not something that can be experimentally tested in the laboratory. Other creationists did affirm that evolutionary theory can qualify as science, but had made a distinction between what they called operational science (e.g. the

effects of exercise on heart muscle) and what they called historical science (e.g. the inferred course of organic evolution).

Interestingly, Losos' concept of evolution, as a science, resembles that of many creationists. He comments:

> "Evolutionary biology is a particular challenge to philosophers of science. It does not fit the standard notion of how science works—itself a caricature—in which a crucial experiment decisively settles the question. Rather, evolutionary biology involves history, figuring out what happened in the past, asking questions not amenable to the experimental method (what experiment can explain the evolution of a giraffe?). I've already discussed how studying evolution can be similar to a detective story, a whodunit whose methods share as much with the study of history as they do with other sciences" (p. 265).

In other words, evolutionary theory is a form of deductive reasoning that *presupposes* the existence of organic evolution at least as much as it 'shows' that evolution happened.

Limitations of field experiments

As noted earlier, the author specializes in field experiments involving (supposed) evolutionary change. These, of course, deal with minor changes in living organisms, and, by themselves, have nothing to do with presumed molecules-to-man evolution.

Even so, Losos is refreshingly candid about the limitations of biological field experimentation:

> "But field experiments have one big disadvantage—you can't control for everything. Nature is varied, even over short distances. And those differences can confound the interpretation of results. That's why laboratory scientists shudder at the thought of doing experiments in the field—the lack of control gives them the willies. If you really want to know how repeatable evolution is, how much the same selective environment will predictably yield the same evolutionary outcome, then conduct your experiment in the lab, where the environment can be precisely controlled" (p. 216).

However, such lab experiments are no panacea either, as described next.

Did experimental *E. coli* bacteria really acquire an evolutionary novelty?

Experiments involving mutations in *E. coli* and other bacteria have been going on for decades. This is part of a research effort that is called LTEE (long-term evolution experiment).

> "As you will recall, *E. coli* naturally can capture citrate in the absence of oxygen by turning on the *citT* gene, which causes the cell to produce transporter proteins that poke out of the cell's membrane and latch on to nearby citrate molecules. What happened in the Cit+ *E. coli* cells is that a duplicate copy of the gene was made … . Normally, the *citT* gene, which produces the citrate-snagging transporter protein, is activated when oxygen levels are low. In contrast, *rnk*, a gene that occurs close to *citT* on the chromosome, turns on when oxygen levels are high, rather than low. Just by chance, when the second copy of the *CitT* gene was accidently created, it ended up being placed right next to the activation switch for the *rnk* gene. This rewired the *citT* copy to be turned on along with *rnk* in the presence of oxygen. This happenstance of molecular miscopying in the DNA replication process gave Cit+ *E. coli* the ability to ingest citrate in the presence of oxygen" (p. 257).

Losos points out that it took over 33,000 generations to get to this point. Moreover, the aerobic metabolism of citrate had failed to appear in every single one of the other lineages, despite apparently identical experimental conditions. The author suggests that the one time it appeared owed to a very unlikely series of coincidences. A gene duplication had to take place and then the gene copy had to land near the promoter of the other gene. This is what permitted the upstart duplicated-gene to express itself under aerobic conditions. In addition, one of more potentiating mutations had first to occur in the lineage—and in a manner unrelated to the eventual aerobic citrate metabolism—owing to the fact that evolution lacks foresight.

The results are very exciting to Losos, and he makes these overstatements: "The conclusion is clear: a set of mutations, occurring in just the right order, can have a major impact, sending evolution down a different, unrepeated path" (p. 259). So many thousands of generations of lab bacterial evolution, and so much hype over such trivially unique results! The bacteria could always metabolize citrate in the absence of oxygen and—lo and behold—the bacteria can now metabolize citrate in the presence of oxygen. Big deal.

This is hardly a manifestation of evolutionary novelty: it is merely the relocation of a pre-existing capability. Nothing else is different. By way of analogy, imagine a building that relies on a photic system to distinguish between daylight and night, in order to automatically switch on interior lights at dusk and turn off the building heating, and then switch off the interior lights at dawn and turn on the building heating. Everything works on schedule. Then, an earthquake occurs, and the wires get short-circuited. The lights and/or heating now come on and off at various times not necessarily in synchrony with the diurnal cycle. The light uselessly comes on in broad daylight. What is novel? Absolutely

nothing. What's more, this turn of events does not even begin to answer this fundamental question: How did the photically driven lighting and heating system originate, presumably without a designer, in the first place? The same questions can be asked about the citrate-metabolizing system in *E. coli*. How did it originate? And how did bacteria originate?

Protective colouration in many organisms—no evolutionary novelty

Unfortunately, not everything in this book shows exemplary reasoning. I examine some of this in the remainder of my review.

Losos thus generalizes on the subject of protective colouration:

> "All around the world, small animals have evolved to match their background, all the better to avoid being detected by their predators. On old lava flows, lizards, mice, grasshoppers, and other animals have evolved to be much darker than they are elsewhere. Conversely, on light-colored soil, animals evolve a pale complexion to blend in with the sandy substrate" (p. 203).

The author defends the validity of Kettlewell's experiments on the peppered moths, and claims that other scientists have confirmed his findings. He also 'spanks' creationists for questioning Kettlewell and, in doing so, he misses the whole point. If Kettlewell is wrong, then it is just 'icing on the cake' in terms of the iconic status of the peppered moths. But if Kettlewell is correct, in no sense is evolution proved right, and in no sense are creationists wrong. The moths are still moths. Referring to the paragraph above, dark lizards are still lizards, dark mice are still mice, etc. Nothing novel, much less molecules-to-man evolution, has been shown, much less proved, by the fact of protective colouration.

That old saw—again—about the poorly designed vertebrate eye

In conventional evolspeak, the 'backwards' retina is supposed to show that evolution lacks foresight, and can only modify what had existed before, and then in jury-rigged fashion. So, according to this chain of evolutionary reasoning, it is a minimum-solution system. Author Losos thoughtlessly parrots the 'backwards' retina argument, and how it is supposed to demonstrate the absence of an intelligent designer.

However, Wells,[1] shows that the octopus eye, despite its 'proper' deployment of retina and blood vessels, is actually inferior in function (visual acuity) to that of the vertebrate eye. In addition, on close examination, it turns out that the 'properly' wired retina is far from optimal even for the bare function of a vertebrate eye. That is, were the high resolution demanded of the vertebrate eye to be expressed in terms of a design utilizing a "properly"-wired retina, the vertebrate eye would have to be impossibly large.

Therefore, far from being 'bad design' or something 'jury-rigged', the 'backwards' vertebrate retina is actually an intelligent, space-saving engineered structure that is necessary for the high resolution of the vertebrate eye at a reasonable size. Losos is completely oblivious to these facts.

There is more. Evolutionist Nick Lane parts ways with most evolutionists, regarding the 'bad design' of the eye. In fact, he turns it around, elaborating on the advantages of the 'backwards' human retina:

> "The wires are colourless, and so don't hinder the passage of light much; and insofar as they do, they may even act as a 'waveguide', directing light vertically on to the light-sensitive cells, making the best use of available photons. And probably more importantly, we have the advantage that our own light-sensitive cells are embedded directly in their support cells (the retinal pigment epithelium) with an excellent blood supply immediately underneath. Such an arrangement supports the continuous turnover of photosensitive pigments. The human retina consumes even more oxygen than the brain, per gram, making it the most energetic organ in the body, so this arrangement is extremely valuable. In all probability the octopus eye could not sustain such a high metabolic rate. But perhaps it does not need to. Living underwater, with lower light intensity, the octopus may not need to re-cycle its pigments so quickly" (p. 175).[2]

Conclusion

This book is packed with interesting, even fascinating, details about living things. It is undoubtedly a fine book for those interested in the natural world. Many thought-provoking examples of convergence are provided.

However, none of this is evidence for evolution. In fact, the book has relatively little to say about evolution itself, as it usually simply *assumes* evolution and then interprets everything through that mental box.

Book after book after book repeats the hoary and discredited 'bad design' argument about the vertebrate retina, and this one is no exception. It is so predictable that it is getting a little tedious to see. However, this ubiquity speaks volumes about the intellectual poverty and shallowness of much contemporary evolutionistic thinking.

References

1. Woodmorappe, J., *Icons of Evolution Revisited: All the old and new icons collapse*, Creation Book Publishers (in press), 2018.
2. Lane, N., *Life Ascending: The ten great inventions of evolution*, Profile Books, London, p. 175, 2009.