

FROM EVOLUTION TO EXTINCTION

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Imagine, for a moment, the planet as a whole. Picture all of the life and movement, the secrets and mysteries, the colors and scenery. Personally, I picture that scene in Wall-E when the captain of a wayward spaceship asks the computer to define “earth” and is promptly bombarded with imagery of berries and rivers and wheat and farms and grass and other life. It’s a bit overwhelming to envision the broad assortment of life that lives on this planet. We call this medley “biodiversity,” the variation and variability of life. So how did life on Earth get to be so biodiverse? What role do we, as humans, have in it?

Enter, Jean-Baptiste Lamarck. In his book *Zoological Philosophy*, Lamarck suggested that species “transmuted” into other species, which explained both the variety and similarities he observed in different species. Most importantly, it explained why creatures were so well suited to their environment. Unfortunately, Lamarck was a man ahead of his time, and his ideas were not accepted by the scientific community for another 50 years when Charles Darwin published his own *On The Origin of Species*. It wasn’t until Darwin voyaged on the HMS Beagle that he was open to the idea that “each species changes” (Wyhe, 2002) into other species according to environmental pressures and struggles. So why do species change? And how?

To answer these questions, let’s look at the example of anoles on the islands of the Greater Antilles in the Caribbean. There are over 400 different species of anoles in the Caribbean and West Indies. Anoles are small, insect-eating lizards with sticky toe pads and dewlaps on their

throats that attract mates. Anoles living on different islands in the Greater Antilles are very similar and well suited to their respective habitats despite the fact that they do not live and breed together. These similarities could either exist because the lizards evolved to various states of well-suitedness and then traveled to other islands, or because lizards on different islands evolved to adapt to their environment in similar ways. Scientists use a phylogeny, a type of tree depicting relationships between species, to determine how closely related each species of anole is, thereby telling us when and how the lizards evolved to fit their environment. Their research showed that the vast majority of the anoles “evolved independently on each of the islands” (Losos, 2007) as opposed to specializing in certain habitats and then dispersing from there. This process is known as convergent evolution.

The process of evolution is made possible by naturally occurring genetic variations in populations. Take for example, an anole whose dewlap has a color that contrasts more with his environment than the dewlaps of the other males nearby. He has a higher likelihood of standing out in the crowd and attracting the attention of a mate, meaning he is more likely to reproduce than his less vibrant friends. The allele in his genetic code that is responsible for his vivid dewlap is passed down to his offspring, giving them more visible dewlaps as well. Over the course of several generations, that specific population of anoles will have more distinguishable dewlaps on the whole. Depending on the reproductive rate of the lizards, this change can take place over several generation times or even just a single one.

Losos, J. B. (2007). Detective Work in the West Indies: Integrating Historical and Experimental Approaches to Study Island Lizard Evolution. *BioScience*.
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Kolbert, E. (2014). *The Sixth Extinction: An Unnatural History*. New York City, NY: Henry Holt and Company.

The human effect on Earth's biodiversity is significant. We introduce species that are endemic to one area to other continents and their ecosystems; "reassembling the biosphere" (Kolbert, 2014). These invasive species compete with the native flora and fauna for space and resources. We also alter the environment and atmosphere in ways that cause not only unnatural migrations among plants and animals but catastrophic extinctions for those who cannot keep up with the new demands of the climate and availability of space. In her book, *The Sixth Extinction*, Elizabeth Kolbert writes about the Panamanian golden frog: once abundant but now completely absent in the wild due to a disease that would never have existed had it not been for rising temperatures world-wide. While efforts are being made to conserve these frogs, they will likely never live in abundance again, and are considered extinct in the wild.

Our earth provides us with valuable resources and we rely on these ecosystem services to maintain our quality of life. We must care for our planet to ensure that it can continue caring for us in this way. But we are not the only ones whose survival depends on the continued health of Earth. All life needs its particular balance in order to continue the cycle of evolution. Life also needs us to become the stewards we were supposed to be in order to interrupt the unnatural mass extinctions that we are seeing. In the words of Jane Goodall, "The greatest danger to our future is apathy."

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