My Island Life

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I've always been a sucker for cheesy Hollywood musicals. My favorite is probably *My Fair Lady*, but I'm not that discriminating. I know that some people are bothered by musicals—people bursting into song, ridiculous costumes, always a sappy ending—but I love it all. I remember, as a small boy, watching the musical *South Pacific* at my grandmother's house on her big TV in a wooden frame sitting on a green shag carpet. This film was particularly striking for a boy growing up in Iowa, where the sea is so far away that it seems more like make-believe than real. I was particularly struck by the song "Bali Ha'i," which tells of longing for a perfect life on a distant, mysterious island. This musical—along with the television show *Fantasy Island*, watched on the same TV—inspired a fascination with islands that has stuck with me through my entire life.

Islands still dominate my life and my thinking. I am now a Professor at the University of Idaho, where I run a research lab studying evolutionary biology. My research has taken me to islands all over the world, where I have been able to observe rare and unique species at close range. Although islands have been crucial to me, both personally and professionally, they have also played a central role in evolutionary biology. Islands are the evolutionary biologist's test tubes. Accidental experiments, repeated across isolated islands in an archipelago, give us a rare glimpse into how life evolves and changes.

This essay will illustrate the way islands have been used by evolutionary biologists to learn about how life has evolved and diversified. I will focus on the field of biogeography, which studies the distribution of species across the Earth. My story will begin with the life of Alfred Russel Wallace, a contemporary of Darwin who is now known as the "Father of Biogeography." Much of Wallace's life was spent traveling among islands in Southeast Asia, witnessing the story of evolution through his observations of species and their environments. I will then turn to the role that islands have played in my own life, from my time as a Peace Corps volunteer in the Solomon Islands to my current research on island lizards around the world.

Throughout this essay, I will highlight some themes that are common to Wallace's research and my own, including the difficulty of studying events in the deep past, the usefulness of studying geographic distributions, and the importance of islands as natural laboratories. Islands are immensely valuable because they can provide an otherwise rare opportunity to observe the clear results of evolution on a scale that we can understand. It is important to recognize the value of islands because island ecosystems are under imminent threat. Habitat destruction and an aggressive set of invasive species are wiping out entire island ecosystems. Without clear and decisive action, the people of the world will lose a good deal of scientific information and natural beauty.

WALLACE AND HIS LINE

Today, Alfred Russel Wallace is remembered mainly for his role in developing the theory of evolution by natural selection. This theory, which posits that evolutionary change is driven by the differential survival and reproduction of living things with varying traits that make them more or less suited to their environment, is the centerpiece of modern evolutionary biology. Most of the great insights into evolution over the past 150 years have involved describing and measuring the consequences of natural selection in wild species. Wallace and Charles Darwin both independently came up with this theory in the early nineteenth century. Unfortunately for Wallace, Darwin had a considerable head start in accumulating evidence, both for evolution and for natural selection. In fact, Darwin came up with the idea of natural selection as a young man, but he waited to publish anything until he had accumulated a treasure trove of facts supporting his ideas. Wallace, on the other hand, seemingly came up with his theory in a flash of insight, while bedridden with a malarial fever. He quickly wrote a brief description of the theory and sent it to Darwin. Darwin was greatly dismayed upon reading Wallace's work, and he immediately moved to publish his own ideas on the subject. Both papers were published simultaneously in the *Proceedings of the Linnean Society* in 1858. Although these first papers are notable, it was Darwin's book, *On the Origin of Species by Means of Natural Selection*, which appeared later in the next year, that has proven revolutionary in the field of biology.

Although some feel that Wallace has been given short shrift, I think that Darwin deserves most of the credit for founding the field of evolutionary biology. After all, it was Darwin's massive body of evidence collected from a diverse array of sources that really spurred scientific acceptance of evolution. In terms of natural selection, then, Wallace has been relegated to Darwin's shadow. But Wallace made another valuable and unique contribution. During his extensive travels in Southeast Asia, he pioneered the field of biogeography, which seeks to explain why species are found in particular places on the Earth. Biogeography is now a thriving field that contributes to our understanding of general evolutionary processes. Knowledge from biogeography profoundly influences our ideas of conservation, enhances our understanding of Earth's great diversity, and provides a virtually unlimited array of evidence for the process of evolution and natural selection.

Although Darwin's work was facilitated by a cushion of inherited wealth, Wallace came from a much more modest background. Wallace was one of nine children, and his childhood was shaped by his family's increasingly dire finances. His father, in particular, was terrible with money, and he made a series of increasingly unsuccessful investments. Wallace grew up in a time when dramatic travelogues from adventurers were wildly popular. Stories of travels from Alexander von Humboldt, William Henry Edwards' account of his journey along the Amazon, and even Darwin's own book about the voyage of the *Beagle* fueled Wallace's boyhood dreams. Unlike Darwin, who was able to draw upon family finances and a network of acquaintances in high society, Wallace and his traveling companion Henry Bates had to organize and finance their own voyage. They planned to collect and to mount specimens of birds and other small animals to sell upon their return. Collecting such specimens was a popular hobby in early nineteenth-century Britain. Wallace decided he would use taxidermy to finance his travels by collecting and preserving interesting species from exotic locales.

Of course, Wallace also had scientific ambitions. When Wallace and Bates left for South America in 1848, Wallace intended to gather evidence for the transmutation of species. It may seem peculiar that Wallace left for his voyage with this goal in mind, given that the publication of the *Origin of Species* was still more than a decade in the future. However, ideas about species changing through time were common topics of discussion in intellectual circles at that time. Wallace had become intrigued with one popular book, *The Vestiges of the Natural History of Creation*, published anonymously but now known to have been written by Robert Chambers. This book was popular, if somewhat controversial, around Europe in the mid-nineteenth century. The author of the book postulated a theory of transmutation in which everything—living things and nonliving things alike—were descended from simpler forms. Although this work was important for Wallace's intellectual development, it was widely criticized by both scientists and clergy, and it lacked a mechanism for evolutionary change.

Wallace was thinking about gathering evidence for evolution and unlocking its mechanism as he set off on his first journey. He spent nearly four years exploring and collecting in the Amazon rainforest, mostly in the region of the Rio Negro, a large tributary of the Amazon River. He kept detailed journals and sketches, and he collected and prepared a small fortune in specimens. When he left for home in 1852 aboard the brig *Helen*, he packed crate after crate of preserved animals and mounted butterflies, hoping to gain enough profit to fund his next adventure. However, after 28 days at sea, tragedy struck. The boat caught fire, and all passengers and crew were forced to evacuate. Wallace survived the wreck, but he lost everything except his journal and a few sketches that he was able to rescue.

A lesser man would have been crushed by this experience and motivated to retire to a quiet life, perhaps far away from the sea. However, for Wallace, this tragedy was only a temporary setback. He collected an insurance payment from the loss of his collection of specimens, which allowed him to support himself and to plan his next adventure. He spent 18 months writing his findings based solely on his journal, his memory, and a few specimens that he had been able to ship back to Britain before his own ill-fated journey home. This period resulted in the publication of six papers and two books, including *Travels on the Amazon*. These books were moderately successful, and they served to introduce Wallace to the circle of natural historians in Britain at that time.

Not content with his first trip, Wallace next traveled to the Malay Archipelago in Southeast Asia. Traveling from island to island, Wallace made a number of remarkable observations about the distribution of species. It was among the thousands of islands in this archipelago that Wallace made his most enduring contributions to evolutionary biology. Importantly, he made these observations while carefully considering the idea of species forming and changing over long periods of the Earth's history. Wallace was one of the first people in the world to view islands as natural experiments, an insight whose value endures today in the field of biogeography. Wallace also managed to secure a large sum of money from sales of specimens from this trip, which he had shipped back to Britain at regular intervals. Unfortunately, he lost most of this fortune, upon his return, through a series of bad investments.

Wallace made a number of key observations during his eight years in the Malay Archipelago. To illustrate the insight gained through this work, I will focus on Wallace's most famous discovery, an imaginary dividing line that runs north between the islands of Bali and Lombok and continues through the strait separating Borneo and Sulawesi to the northeast (FIGURE 1). This line is now known as Wallace's line, one of a set of boundaries that separate the Earth into major biogeographic provinces. Biogeographic provinces are large regions that contain a (mostly) unique set of species. Anyone who has traveled to different places in the world has experienced these regions. For example, one finds jaguars in South America and leopards in Africa, oak trees in the Northern hemisphere and eucalyptus in Australia and southeast Asia. In some cases, these provinces blend gradually into one another, with species slowly replacing each other as one travels from place to place. Wallace, however, recognized that, in many cases, sharp boundaries mark the edges of the ranges of many different species. This results in regions with distinct boundaries shared by large sets of even distantly related species. Wallace especially noted that these lines often do

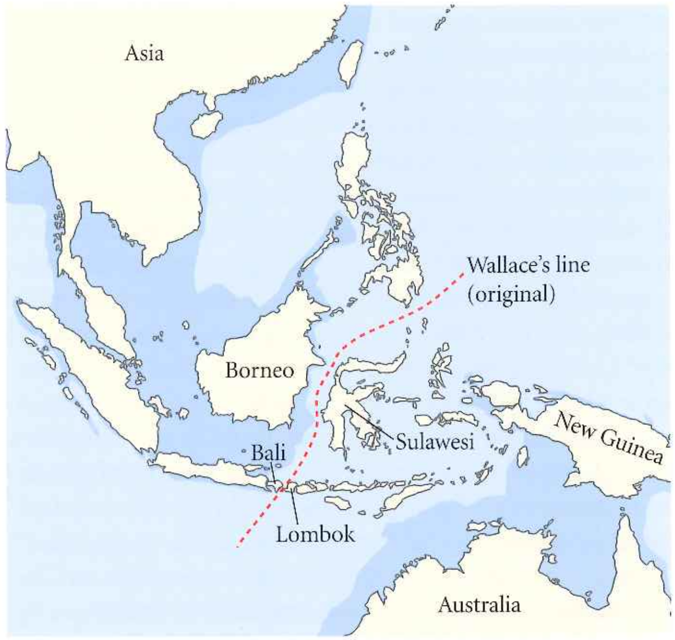

FIGURE 1 Wallace's line

not seem to have anything to do with transitions in the physical environment. As one crosses Wallace's line, the physical factors important to living things—for example, soil, temperature, and rainfall,—remain fairly consistent, but the species living in those similar environments are dramatically different.

Traveling across Wallace's line from Bali to Lombok, one leaves the forests of Asia and enters those of Australia. Only west of Bali does one find orangutans and tigers; east of Lombok, tree kangaroos and cockatoos. Megapode birds, remarkable birds that bury their eggs far underground where they can be warmed geothermally, live only to the east of Wallace's line. These are but a few examples of the multitudes of species with geographic ranges that go up to, but not beyond, Wallace's line. If you think of islands as test tubes, then crossing Wallace's line takes you from one test tube to another. The physical environment of each test tube—temperature, rainfall, seasonality—is very similar, but the species living in those environments are entirely different. You can observe two distinct experiments starting with similar conditions but finding entirely different outcomes.

In discovering his line, a sharp boundary delimiting whole sets of interacting species, Wallace had made a discovery about the geological history of the Earth.

Looking at sea-floor maps, we now know that Wallace's line corresponds to the outer limits of the Sunda Shelf, the edge of the continental landmass that lies under all of Southeast Asia. In other places in the Malay Archipelago, islands might be separated by narrow, shallow channels in the sea. During earlier periods of the Earth's history, global temperatures were lower. During those cooler periods, more of the Earth's water was sequestered in the polar ice caps, resulting in much lower sea levels. Many islands in the archipelago were joined as large landmasses during those times. However, the deep trench along Wallace's line meant that Bali and Lombok (and Borneo and Sulawesi, and all the other islands on either side of the line) were never joined, even when sea levels were at their lowest. Oceans form a barrier to the dispersal of species that live on the land. The geology of Wallace's line is then reflected in the evolutionary history and geographic distribution of living species. It is this ancient geological feature that defines the boundaries between two sets of island test tubes. By looking closely at the distributions of species on the Earth, we can actually look back in time, deep into the history of the planet, and describe evolutionary forces that have acted over tens or hundreds of millions of years.

Given my love for island reptiles, I am particularly interested in using Wallace's line to gain insight into the evolution of lizards. One group of lizards, the monitors (genus *Varanus*), provide a beautiful example of how Wallace's discovery can help us to understand the deep past. Monitor lizards are found in Africa, Asia, Australia, and the Pacific Islands. There are many species of monitor lizards that are found in the Malay Archipelago; for example, the Komodo dragon, a huge monitor lizard that lives on an island of the same name just east of Wallace's line. In recent years, scientists have been able to reconstruct the evolutionary relationships, or phylogeny, among all living monitor lizards by comparing their genetic signatures, the series of base pairs that make up their DNA. All of the monitor lizards found in the Malay Archipelago can be divided into two evolutionary groups. These groups are called "clades" by evolutionary biologists because each group includes all of the descendants of a particular common ancestor. Remarkably, all of the species in one of the two main clades of monitor lizards are found to the west of Wallace's line, while all of the species in the other clade are found to the east. Monitor lizards, then, show a straightforward correspondence between geology and evolution. Wallace's line, drawn across the oceans of present-day Earth, marks an ancient evolutionary event that separates two very diverse and old groups of islands lizards.

To appreciate fully the value of the insights gained from Wallace's line, one must consider just how difficult it is to learn things about particular events that occurred on the Earth long ago. The history of the planet is one of dynamic change. Drastic events do occur, but their effects are often obscured by the great extent of time that passes before we are able to observe them. For humans, looking back even a few hundred years is fraught with difficulties and challenges. The joy of biogeography lies in using information about where species live on the Earth and a knowledge of their evolutionary relationships to shine a light millions of years into the past. Wallace's description of this line was an important landmark for evolutionary biology. His discovery marks the birth of a new way of thinking about why species are found in one part of the Earth but not in another. We now think of the ranges of species as fluid, with edges that move over time and that sometimes cause the species to split and to evolve into new forms. Importantly, we can use this framework to build up a picture of macroevolutionary change and to understand the formation of new species.

MY ISLAND LIFE

My own work has been inspired by Wallace's use of islands as evolutionary test tubes. My island story starts well before my career as a professional scientist, on an island called Santa Ysabel in the Solomon Islands. My wife Lisa and I were in Ysabel as high-school science teachers working for the Peace Corps, an American volunteer organization. We were assigned to teach at a small school on Ysabel called Sir Dudley Tuti College. I spent two years teaching biology, chemistry, physics, and math. Although I worked long days with minimal equipment, the students were enthusiastic. I treasured my time on Ysabel teaching at a boarding school surrounded by lush rainforests. Giant fruit bats fought in papaya trees in my yard. I would go on walks in the forest with my students and find astounding creatures, such as tree opossums and large, ill-tempered centipedes. Once, during a lecture on physics, I looked out to see a small owl sitting on the back of one student's chair. The student had found it on the forest floor, abandoned, and he brought it back to the dormitories to raise.

My favorite species that we found on Ysabel was the prehensile-tailed skink, a giant herbivorous lizard that lives high up in cavities in the trunks of trees. These animals are a prime example of the strange and wonderful creatures often found on islands. These giant, grey-green skinks have huge, powerful jaws, sharp claws, and remarkable prehensile tails. They climb through the forest eating leaves that would otherwise be food for monkeys. Prehensile-tailed skinks care for their young, and mothers aggressively defend their offspring for months, perhaps years, as they grow to maturity. Here, well east of Wallace's line, there are very few mammals. In many cases, reptiles have adapted to fill the ecological roles, or niches, left vacant by the near absence of mammals. Islands provide an opportunity for evolution to tinker for millions of years in relative isolation, sometimes leading to striking new solutions to ecological problems. In this case, a giant lizard had evolved to feed on leafy vegetation high in the trees, a niche often filled by primates in other parts of the world.

Although our return from the Solomons was not nearly as tragic as Wallace's trip home from South America, it was still a trying experience. During the last year of our time as volunteers, the country was experiencing conflicts between local people from two islands in the archipelago, Malaita and Guadalcanal. These "troubles" flared up from time to time, sometimes resulting in murders and kidnappings. However, all of this happened near the capital, Honiara, which was many days journey from our house in the forest. Any danger seemed distant, until one morning when I turned on the radio and was greeted by static. I flipped through the dial, turning to every station, but all I was able to get was static; there was no music or talk radio anywhere. Finally, I found one station that was playing a recording. A deep-voiced man intoned that the prime minister and other governmental officials had been taken into custody for their own protection. The voice repeated, slowly and deliberately, "This is not a military coup."

Of course, it was a coup. We were evacuated by the United States government, leaving our house and all of our possessions. In fact, for safety reasons, we were not allowed to tell anyone where we were going or why. Quite literally, we just disappeared into the night. This was a wrenching experience. We left our co-workers and friends as their country descended into civil war around them. Returning to the United States, I felt out of place, no longer at home in the "modern world." I was overwhelmed by the complexity and the pace of life. My mind was still fixed on islands.

I moved to St. Louis and began my graduate research on lizard evolution. Many people believe that scientists are driven by deep and profound questions, choosing research projects that can answer those questions. But I was driven mainly by the desire to return to an island—any island, anywhere, and as soon as possible. Eventually, I arranged to carry out field research on two spectacular groups of lizards: anoles (in the genus *Anolis*) and day geckos (in the genus *Phelsuma*). These two groups of lizards live on islands in the Caribbean and in the Indian Ocean. In the course of my thesis research, I traveled to islands around the world to study these lizards. After a few weeks in the field, I realized that these lizards have unknowingly been the subjects of a grand natural evolutionary experiment.

Copying Wallace, I set out to study the process of evolutionary diversification, or how species transform from one ancestor to many and varied descendants. This process usually takes a very long time—typically, tens of millions of years. Ideally, I'd love to set up an experiment by creating a set of large landmasses. I might fill them with plant life and allow them to be covered in lush tropical vegetation. I would then seed each of them with a single species of lizard. The last step would be to allow the experiment considerable time to run—20 million years might be sufficient time for a rich community of new and distinct species to evolve. I would then send a research team (perhaps my distant descendants, probably no longer very similar to modern humans) to investigate the outcome of this replicated experiment.

Of course, that would not be possible. Luckily, however, something similar has been happening over the past 50 million years on the Earth's oceanic islands. The experiment has been running for long enough now, starting well before the appearance of the first humans in East Africa, and islands around the world are now filled with an extraordinary variety of species. We need only to go and measure species on those islands to learn profound things about the factors that drive evolutionary change.

When I started my project, much of what we knew about lizard communities on islands came from a beautiful set of studies on lizards in the Caribbean Sea. The Caribbean is dotted with islands, both large and small. The four largest of those islands—Cuba, Hispaniola, Puerto Rico, and Jamaica—are called the Greater Antilles. Traveling to these islands, one is struck by the abundance of one type of lizard, called anoles. Anoles live mainly in trees, and they are usually a nondescript green or brown color. Their most impressive feature is a dewlap, a colored flap of skin under the chin that lizards (usually the males) can extend to attract mates and to declare their territory. Different species of anoles use distinct perches and have body shapes that are well suited to their habitat. These specialist anoles are referred to as ecomorphs. For example, the "trunk–ground" ecomorph is a medium-sized lizard that lives near the base of a tree trunk. These lizards typically perch with their head pointed towards the ground, leaping down to catch any small insects that pass by. Another ecomorph category is the "crown–giant" anoles, large lizards with broad heads that live in the forest canopy.

With minor exceptions, one can find all of these ecomorphs on all four islands in the Greater Antilles. Species within ecomorph categories are so similar that, unless trained, you would be hard-pressed to tell them apart. For example, faced with four "trunk–ground" anoles, each from a different island, you might conclude that they were all the same species. But, in fact, they are subtly different species that differ in their color, in the arrangement of their scales, and in other traits. And there is something even more surprising about these anole ecomorphs: despite their remarkable similarity, these four specialists are not very closely related to each other. When we reconstruct the anoles' evolutionary family tree, we find "trunk–ground" species in several places in the tree widely separated from the others by millions of years of evolution. In other words, species of the same ecomorph living on different islands, although very similar in their traits, are not closely related to each other. Instead, even very different-looking lizards from each individual island are usually closely related to each other. This is because the lizards on each island all descended from a small number of initial colonists that have evolved and diversified into a wide variety of descendants.

The repeated evolution of ecomorphs gives us a deep insight into evolution when we think of the Greater Antillean islands as natural laboratories. In all four cases, ancestral lizards have evolved and diversified more or less independently of each other, and yet have converged on the same set of solutions to the challenges faced by the environment. For example, at some point in the history of Jamaica, a trunk–ground anole evolved as a solution to survival in the forest. Remarkably, at least three other times, a different species of anole evolved that same solution on the other islands in the Greater Antilles. This particular island experiment tells us that evolution can sometimes be predictable, even over very long time scales.

One way to explore just how predictable evolution can be is to repeat the experiment with a different group of lizards. In fact, we have such an opportunity, the results of a totally different island experiment halfway around the world. In the Indian Ocean, there are many islands: Madagascar, the Mascarene Islands, the Seychelles, and the Comoro Islands. There are no anoles in the Indian Ocean (at least not yet, but anoles are spreading slowly around the world by means of human-aided introductions). Instead of anoles, the lizards in this part of the world are day geckos. As the name implies, day geckos are some of the only gecko species in the world that are active mostly in the daytime. Unlike typical geckos, which are dull and brown, day geckos are emerald-green lizards that are often flecked with spectacularly colored markings. On islands in the Indian Ocean, day geckos have taken up a new lifestyle and have diversified into a wide array of species. This is a natural experiment on a global scale. Islands were formed in the Caribbean and the Indian Ocean, but were seeded by two very different types of lizards, anoles and day geckos. Does this different starting point affect the outcome of evolutionary diversification?

In some ways, day geckos and anoles support the idea that evolution is predictable and repeatable. For example, from years of research on anoles, we can predict that when two or more species of lizards are found together, they will use perches of different heights, different diameters, or both. Furthermore, their body shapes will reflect the habitats that they use. Species that live on broad perches have longer legs and can run faster, while species that live on narrow perches have shorter legs and are better at balancing. All of these predictions seem to be true for day geckos as well. When I find a set of species of day geckos living together in the Indian Ocean, no two species ever use the same perches, and the different species have body shapes that match their perches. In both groups, we attribute these effects to competition among species. When different species live together, they must partition their efforts to collect food and to escape predators. Without differences among species, eventually one form will drive all of the other forms to extinction.

The most spectacular feature of the anoles, however, is their repeated evolution of ecomorphs. Are these ecomorphs present in the day geckos? The quick answer to this question is "no." In fact, several ecomorphs that repeatedly evolve in anoles are absent from the Indian Ocean. There are no "crown–giant" day geckos, for example, and day geckos never go onto very narrow twigs, as do some of the anole ecomorphs. Instead, day geckos seem to partition their habitat use in a different way. Some species of day geckos are found almost exclusively on smooth, green palm fronds, while other species are typically found on branches of trees with bark. There are some characters that these "palm-frond specialists" seem to share with each other, even though they are not closely related, such as short limbs and narrow, pointed heads. By contrast, anoles do not seem to partition their habitat among species in this way. Day geckos do have ecomorphs, but the solutions that they have arrived at are different from those of the anoles.

Across the four islands in the Greater Antilles, our evolutionary "test tubes" show striking repeatability. Starting from different ancestral anole species, one observes the same outcome of evolution after a long period of time. So, is evolution predictable? The day geckos suggest that our answer must be qualified. Here, we have rerun our experiment, but starting with a very different set of ancestors. Although some of the broadest aspects of our islands are similar across ocean basins, day geckos and anoles differ in many important details. Evolution is predictable, but only over certain time scales and at certain levels of detail. If one changes the starting conditions too dramatically, the details of the final outcome can be difficult to predict.

THE PROMISE AND TRAGEDY OF ISLANDS

Although I emphasized the diversity of the species that are found on the world's islands, one can be struck, traveling today, with the opposite impression: that islands around the world are surprisingly uniform. The same set of invasive trees—acacia, eucalyptus, guava—are spreading through Hawaii, Puerto Rico, Mauritius, Bali, and other tropical islands throughout the world. There are places on each of those islands where even a trained biologist, planted in the middle of a forest, would be able to find only invasive species and to have no idea where she or he was. This new uniformity of the world's islands is an affront to the geographic diversity that makes islands special as windows into the past. If islands are evolution's test tubes, then we are rapidly contaminating our experiment and hindering our ability to learn about the past history of life on Earth.

The natural world is connected with each species interacting with dozens of others in complicated ecological networks. It is tempting to think that these networks are stable and resilient. Experience on islands, however, has taught us otherwise. Over and over again, humans have released species into rich and complex ecosystems and have wreaked havoc on them. Island species can be particularly vulnerable because they are often naive about predators. For example, the brown tree snake, introduced to Guam in the 1950s, led directly to the extinction of at least nine bird species, all of which had evolved in the absence of any snake predators. Furthermore, the events that brought today's invasive species to their new island homes are fundamentally different from the natural rare dispersal events that brought the initial colonists to those islands. We are unwittingly helping the same set of species establish populations on thousands of islands around the world. This will eventually make all of those islands indistinguishable from each other. If we homogenize the Earth's biodiversity, we will have lost something beautiful and important.

When I return home from a field trip, I often feel dizzy to be back in the real world, having spent a few weeks in my island "test tubes" trying to peer deep into the history of life. These natural experiments, impossible to repeat or to recapitulate, are under great threat now from a set of very destructive invasive species. Observing evolution on islands is an idea that can capture the attention and the imagination of even very young students. It is easy for the public to understand why today's massive telescopes, like the Hubbell, are precious scientific treasures. Those tools allow us to see light from distant stars that has been traveling though space for millions of years. We can, quite literally, peer deep into the history of the universe. Islands can serve a similar purpose for evolutionary biology; if we destroy them, we will lose otherwise irretrievable information.

Thanks to the miracles of Wikipedia, I now know that the song "Bali Ha'i" was inspired, in part, by a real island. The island of Ambae lies in the far western Pacific, east of Australia and southeast of Papua New Guinea and the Solomon Islands. Islands in this part of the world are incredibly dramatic: deep green, rising steeply from coral seas, formed and shaped by violent volcanic eruptions. Although I've never been to Ambae, I've come close, and I have spent a significant part of my adult life in Melanesia and other islands around the world. I no longer think of islands as miniature versions of paradise. Instead, I know from experience that they are difficult to reach and can be harsh environments for humans. But viewing islands as evolutionary test tubes instills a greater appreciation for their beauty and value. Each time I travel to islands, I feel fortunate to reap the benefits of yet another of nature's great experiments.

SUGGESTED READINGS

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