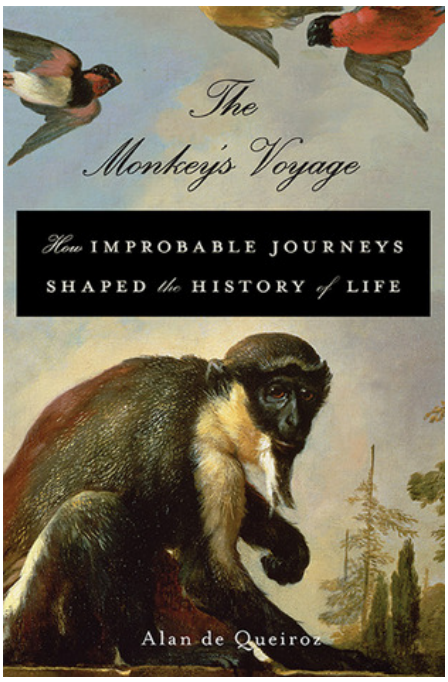

The Monkey's Voyage: How Improbable Journeys Shaped the History of Life

Alan de Queiroz

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The Monkey's Voyage: How Improbable Journeys Shaped the History of Life Alan de Queiroz Throughout the world, closely related species are found on landmasses separated by wide stretches of ocean. What explains these far-flung distributions? Why are species found where they are across the Earth?

Since the discovery of plate tectonics, scientists have long conjectured that plants and animals were scattered over the globe by riding pieces of ancient supercontinents as they broke up. In the past decade, however, that theory has foundered, as the genomic revolution has made reams of new genetic data available. And the data has revealed an extraordinary, stranger-than-fiction story that has sparked a scientific revolution.

In *The Monkey's Voyage*, biologist Alan de Queiroz introduces a radical new theory of how species as diverse as monkeys, baobab trees, and burrowing lizards made incredible long-distance ocean crossings: pregnant animals and wind-blown plants rode rafts and icebergs and even stowed away on the legs of sea-going birds to create the map of life we see today. In other words, these organisms were not merely victims of continental fate; they were masters of their geographic destiny. And as de Queiroz shows, the effects of oceanic dispersal have been crucial in generating the diversity of life on Earth, from monkeys and guinea pigs in South America to beech trees and kiwi birds in New Zealand. By toppling the idea that the slow process of continental drift drove odd distributions of organisms, this new theory highlights the dynamic and unpredictable nature of the history of life.

In the tradition of John McPhee's *Basin and Range*, *The Monkey's Voyage* is a beautifully told narrative of a profound investigation into the importance of contingency in history and the nature of scientific discovery.

The Monkey's Voyage: How Improbable Journeys Shaped the History of Life Details

Date	:	Published January 7th 2014 by Basic Books (first published September 21st 2013)
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From Reader Review The Monkey's Voyage: How Improbable Journeys Shaped the History of Life for online ebook

Mya says

I had to read this book for my evolutionary biology class. I have to say as a person new to the field, this book provided wonderful insight to understand the basics. I would say the book is bias in many cases and the beginning was kinda dull, but that could be a bias opinion of my own. I have to say the author is wonderful with lightening the mood and has done a very good job providing support for his claim.

Steven says

De Queiroz writes a detailed and well thought out argument in support of the idea that much of our planet's biodiversity stems from transoceanic voyages. He outlines the various schools of thought, and through personal research and working closely with other biogeographers, he weighs the evidence for such journeys against the evidence for biodiversity as a function of continental fragmentation. Of course, views have changed over time as new tools have become available (most notably, DNA analysis)' and he answer is rarely black and white, but his arguments are quite sound.

I appreciate his passion for looking at the evidence, and letting the facts inform theory, rather than letting theory drive progress -- which results in ignoring uncomfortable facts and, as it turns out, very little progress. His shout out to Thomas Kuhn's *The Structure of Scientific Revolutions* took me back to a college first-year philosophy class that I apparently remembered more of than I would have thought likely. De Quieroz's writes clearly and entertainingly about this topic in a way that can be rare among academic types. I'd sign up for his classes!

Kimberly Edwin says

I just finished this one and I enjoyed learning about vicariance vs. dispersal in evolutionary theory. I am on a serious science bender and have read numerous evolution books.

Wayland Smith says

From the reviews, I had expected a book about how different animals ended up developing on different continents. This is sort of that, but with a lot of side-trips and digressions. The first section of the book is largely about continental drift and at times it feels like you need a geology degree to really understand it.

A lot of the book is about arguments between factions of scientists. People didn't believe continental drift at first, and there is a lot about that debate. Then there are different factions that believe animals got from place to place by accidental trips on rafts, vs those who think all animal species got where they are either by land bridges (from Hawaii? Really?) or back when all land was one big supercontinent.

The book is a bit dry, really. There are long sections about geology, genetics, and scientific arguments. I read a bit of everything, and do like some science texts, but this one just didn't really grab me.

Rossdavidh says

No matter what group of humans you wish to consider, it is virtually always the case that they will find a reason to split into two factions. This is true of religions, alternative music scenes, political parties, you name it. Perhaps you might think that scientists who study evolution would be different. You'd be wrong.

Alan de Queiroz is an evolutionary biologist, and he's clearly taken sides along one of the many fault lines which divide biologists from one another. In the case of scientists, of course, there are some differences in how schisms get resolved. Over time, one side or the other of a debate will have more and more difficulty reconciling their beliefs with the newest data. To hear de Queiroz tell it, the data from the last generation or so has been mounting in support of his side. But before he can tell us about that, he has to explain what the point of contention even is.

Suppose you have two species, living in different places, perhaps separated by some expanse of ocean. If those two species are clearly related, there are basically two kinds of explanations (in modern biology, when we do not have to evaluate the possibility of God repeating himself).

One, there could have been a single species, back when the two spots of land were connected. This could have been during an ice age, when more water was frozen at the poles and the ocean levels were lower, or if it was a long time ago it could be that continental drift has ripped these two pieces of land apart when once they were joined.

Two, there could have been one of these species on one spot of land, and a few of them swam, flew, or floated over to the other. In the case of birds and bats, this is pretty non-controversial. But for some other cases, it is not. To hear de Queiroz tell it, Not At All. I should note that most of this history of this nook of the world of science (and scientists) is one I have never read anything on before, so I only have de Queiroz's version of events. But to hear him tell it, there was an orthodoxy that grew up in the 1960's (in opposition to the orthodoxy which preceded it), that "earth and life evolved together". In other words, animals (that don't swim or fly) evolved more or less in place, and as the different parts of the ancient continent of Pangea split apart and went their separate ways, so did the gene pools of the species that lived on them.

The first part of the book takes us through the time when the very idea that continents could "drift" was controversial, as radical in its day as string theory today. It is, you must admit, somewhat counterintuitive that the very earth beneath your feet could "drift". The scientists who concluded that the life on the earth must have evolved along with this drift, probably thought they were on the right side of history, and that their opponents were stuck in a pre-modern mindset.

But, as sometimes happens, one generation's "modern" becomes the next generation's "old hat", and what your grandparents wore may look cooler than what your parents wore. As gene sequencing became cheaper and cheaper, the concept of "molecular clocks" came along. Essentially, it means looking at how many mutations have occurred to separate two species, and using that to try to calculate the likely time since they split. It is complicated, and there are a lot of caveats, but over time it has gotten cheaper and cheaper to gather more and more data. In de Queiroz's opinion, anyway, it has swayed things back to the pre-1960's idea of species being spread primarily by chance events (like snails clinging to the feet of ducks, or big storms

blowing natural rafts of trees and dirt out into the ocean, with animals along for the ride).

The interest, for me, is in the stories of how one generation first learns, then grows suspicious of, then overturns the idea of the generation before it. Next, like the old punks looking with disdain at the raver kids who listen to electronic dance music, that generation of once-revolutionary scientists watch the researchers younger than them turn away from their ideas, and embrace something new. I think, for anyone who was ever an iconoclast, it is difficult to see yourself treated with the same attitude that you once gave your elders, back in the day.

The scientific issues of this book are intrinsically interesting, if you care about evolution, which is to say life and how it got that way. However, the real drama to this book is the generational conflict of ideas, making it a very human drama as well.

Rj says

A really dry book that sadly does not live up to the exciting title. De Queiroz looks at how biologists have arrived at explanations for populations of sameness and diversity across the planet and places them in historiographical context. In the end I skimmed it looking for anything interesting and found myself unable to finish the book.

Louise says

I found The Monkey's Voyage surprisingly amusing; the narrative "feel" of it makes it appropriate for casual reading as well as academic. It reads as though one is having a nice discussion with someone who is clearly well-versed in his subject but who can't hide his amicable humor -- or, in some instances, his sharp snark.

Alan de Queiroz's first full book serves as a kind of primer on biogeography, the study of the distribution of species across our planet (or the "analysis of the spatial distributions of organisms" if you want to get fancy). Well, perhaps it isn't so much a primer -- though the author does patiently explain some of the basic concepts of the field -- as a sort of history of the development of biogeography as a science, like a narrative tour of sorts.

My impression is that The Monkey's Voyage is written for a semi-scientific audience, by which I mean one should definitely already be familiar with the basics of ecology and evolutionary biology but needn't be a professional in the field. Certain unavoidable terms (vicariance, dispersal, taxon, cladistics, etc.) are briefly and nicely explained, but a quick familiarity is definitely expected of the reader. Bits of snark make for an amusing, if not entirely neutral, read (though the author never claims neutral ground).

My favorite example of this can be found on pages 89-90, in an examination of Gary Nelson and Norm Platnick's particularly enthusiastic insistence on a certain point of view:

"It's a grand vision for humanity, placing us within the great story of the fragmentation of the world's biotas through continental drift. It's an epitome of the Croizatian vision that 'Earth and life evolve together.' It's . . . [*page turn*] . . . also completely looney."

I'd recommend this for those who are curious about biogeography (obviously) as well as those who might like a somewhat idiosyncratic glimpse of some of the less-than-gentlemanly "feuds" that can erupt between scientists when their major hypotheses are at odds.

Note: I received a free copy of this book from Basic Books via a Goodreads giveaway in exchange for an honest review. (Thanks!) Full review can be found on my blog: http://www.lonestaronalark.com/2014/0...

Andy Janes says

Took away for me to get into this. Not the most engaging writing style, but it really picks up about half way in and becomes an easier read. A little bit more hard science-y/less pop-sci than I was expecting.

Cade says

This was a very interesting book. I primarily enjoyed this book because it gave me some interesting new (to me) information in a highly understandable and readable presentation. I liked the author's logical development of the evidence in favor of long distance dispersals, and I appreciated his attempts to consistently be frank about the relative strengths and weaknesses of evidence for his hypothesis. I found that the author seemed more reliable because of his relentlessly respectful (perhaps even defensive) characterization of scientists who oppose his ideas. This frank, even-handed tone goes hand in hand with what I perceive to be a genuine desire to remain self-aware and to make the content of the book expository rather than persuasive. In this, I believe the author generally successful although it is clear that the author is convinced of his thesis and wants the reader to walk away from this book also convinced of the prevalence of trans-oceanic dispersal of species throughout history.

I enjoyed the content so much that I would have been happy to get more detail on some of the technical points. For example, what, if any, predictions long-distance dispersal should suggest that may be subject to testing now or in the future. Also, I would like to understand better assumptions and uncertainties involved in using DNA for dating divergence. There is a whole section on "molecular clocks" in which the author does touch on these aspects, but it is so crucial to subject that I would have appreciated even more information. I think in avoiding this topic, the author was unnecessarily afraid of "scaring off" non-specialist readers with "technical" details.

The primary reason this book lost the one star it did is because it was insufficiently focused at the beginning and end. Initially, it went on at excessive length about the history of biogeography and the various schools of thought(a point which the author explicitly admits he indulged in at least part out of personal interest). Then, the final section in which the author tried to move from explaining the evidence for long-distance dispersal into trying to convince the reader it was important was unfocused, repetitive, and long. It seems that the author (rightly) worried that he was not effectively making a strong point about why people should care about long-distance dispersal. Instead of leaving it to the consideration of the thoughtful reader, he just made the point ineffectually over and over with slightly different language and examples each time. This was an unfortunately frustrating finish to an otherwise enjoyable book.

Nola says

The premise is that dispersal was and is an important force behind the distribution of plants and animals throughout the history of living organisms. On the other hand, there is a belief that vicariance, or separation as tectonic plates move organisms apart, rather than more recent long distance dispersal, is mainly responsible for current plant and animal distributions.
The author starts with a history of the development of concepts of evolution and biogeography, which is worthwhile on its own. It is a chronological history touching lightly on people who developed key concepts, and it includes enough personal details to make the reading fun instead of a chore. He does, however, indicate negative feelings toward the scientists with whom he disagrees. This comes across in choice of words, for example, writing about Léon Croizat on the first page of the book, he used the words seething, seethed and hated. This sets the tone for Léon Croizat. The Monkey's Voyage, in addition to outlining concepts, is also a history of scientific discoveries and how these drove the concepts. These include putting the discovery of plate tectonics, the nature of the ocean floor mountain ranges and rifts, the flipping back and forth of the earth's magnetic field, and advances in molecular dating in the proper time frame and intellectual context. There is a lengthy and useful explanation of the molecular clock. This explanation is thorough and engaging, but it includes parables that could be shortened to make the book move along better. The book is also worth reading for its clear, concise explanations of what plant and animal groups exist in what places in the world. This is essential for developing the main point of the book, and is probably common knowledge among scientists, but was better than anything I had read.
As far as the purpose of the book, the author convinced me. He is a scientist familiar with the current scientific methods. He read a lot of papers and contacted a lot of scientists on both sides of this issue. The main points included New Zealand plant fossils showing that the existing plants are much younger than the breakup of New Zealand and Antarctica 75 million years ago, Australian sundews found on South American tepuis (table top mountains), amphibians on volcanic islands, the age of divergence between old world and new world monkeys, and the branching order of ratites.
The book does such a good job of making its point obvious that the book itself seems unnecessary. That is why enjoyed the background information more than the arguments for dispersal. Since I haven't been following the argument, I should read more than just this one very convincing book. Also, the author gives the impression of wanting badly to prove his point, and I prefer a book without so much emphasis on the war between dissenting views, let alone his discussion of the philosophy of paradigms.

Last Ranger says

Life Finds a Way:

If you've ever wondered why certain plants or animals live where they do, then this marvelous book may give you new insights on how, and when, they got there. In "The Monkey's Voyage" author Alan de Queiroz helps you explore the history and current theories in Biogeography and Evolutionary Biology. Although there are some technical parts the book, for the most part, is layman friendly for anyone who has, at least, high school Biology under their belts. Different parts of the world share similar environments but are all protected from invasion by some sort of barrier; a mountain range, a major river, or the sea itself, among others. How does life breach these barriers? Do these barriers change over time and what causes them anyway? Throughout history scientists have sought to explain how related organisms managed to end up in different parts of the world. At first they envisioned a network of land-bridges that connected various parts of

the world but that got kinda awkward when trying to explain places like the Hawaiian archipelago or the Atlantic Ocean. For a while it seemed like Continental Drift might save the day, but even Plate Tectonics had some problems. Long range dispersal by wind or ocean currents was an option, but that met with a lot of resistance from the scientific "old guard". Queiroz traces the changing fortunes of various theories and explains how each one might fit into the big picture. Along the way he will introduce you to different dating-technics like the Molecular Clock and the, often incomplete, fossil record. Queiroz's writing style is straight foreword and easy to follow as he travels the world and consults with other specialists on each issue. To some extent the controversies continue to this day but it looks like some sort of consensus is at last possible, or not! The book has several charts and graphs to illustrate different concepts as well photos from different sources, including the author. For me "The Monkey's Voyage" was an exceptional read, filled with fresh ideas and eye opening thoughts on one of Biology's biggest mysteries. I highly recommend this book to anyone who has an open, but skeptical, mind. You may find it as entertaining as I did. I had no technical or downloading problems with this Kindle edition.

Last Ranger

Henrique Maia says

I have to confess I was pleasantly surprised with this book. Judging only by the title, I read it thinking I was about to learn more about the evolution of our genus, and thus enhance my understanding or our own evolution. By reading it, I was taken into a completely different journey, one that took me to the heart of the complexities of life’s dispersion, challenging my many assumptions on the subject. And this makes the book interesting in two ways.

First, if you, like me, are unaware of biogeography as a scientific endeavor, this book will not only show you the history of the discipline, but also map its controversies, its main characters, and the current state of the art as far the author goes.

The second may be implicit, and not immediately obvious, but it relates to the way we tend to think about evolution and the development of life in general on our planet. Maybe it’s something unavoidable and that it relates to the way we humans tend to think in generic terms. We tend to prefer neat explanations, preferably simple and narratively compelling. However, that’s not how things happen or have happened to life. Deep is the deep history of time, and life, having been around such a long, long time throughout that history, makes what seems impossible at some point not only possible, but factual. Elaborate way to say that life, in all its complexities and long history, has managed to find innumerable ways to keep on going, to keep on striving, notwithstanding the many geological pressures it had to cope with.

So this book had the merit of making me rethink a lot of things I thought I understood, and many of my presuppositions about how life has spread about and occupied the whole of earth. If you, like me, have any interest in these topics, maybe you’ll find it as interesting as I did.

Alger says

This is a book with a purpose, a trait which it holds in common with all the best popular science books. Queiroz is on a mission here to explain to the layperson exactly what the state of the art is in biogeography and the evidence behind an emerging consensus on species dispersion. To do this he pulls in considerable history, a number of key personalities, and ties them together with personal anecdotes.

The anecdotes nearly killed this book for me. To be clear, Queiroz is not presenting himself as a major mover of the discussion on species dispersion. Instead, he is an interested participant in the discussion, a convert from continental vicariance to long-distance dispersion theories. The book opens with his own work with garter snakes in Baja California, and his slow-dawning realization that they were recent emigrants from the other side of the Sea of Cortez. That pretty much ends Queiroz's participation in the debate, from here on out he is a reader of journals and monographs, and our connection to the big guns. As a result of Queiroz's distance from the academic discussion the anecdotes we are served are extended monologues of his trips to New Zealand, or family vacations in the Great Basin, or his meeting/emailing/visiting the leading voices in the debate. I am sure this was intended to personalize an otherwise abstract topic, but these are lengthy digressions that add nothing to the case he is trying to build, and obscure that there is a purpose to the organization of the book.

And that is what saves this book in the end; this is a compelling and knowledgeable argument for long-distance dispersion of plants and animal species in conjunction with some measure of vicariance thrown in. This compromise position emerges as the only possible conclusion from the mounting piles of evidence and "how-possibly"'s that come fast and thick in the later chapters. The organization of the evidence is obviously modeled on Darwin, and steps up a ladder from easiest to accept premises (seeds cross small ocean barriers) to premises that are so incredibly unlikely that only deep time makes the odds even calculable (monkeys, on large natural rafts, surviving a weeks-long voyage across hundreds of miles of open ocean?). The laddering is not strictly necessary since all the evidence points to an early primate trans-Atlantic voyage, but the premises of the argument are established for the reader by moving forward in smaller steps and so the entirety is easier to swallow.

Despite Queiroz's personal distance from the heart of the debate, he is certainly knowledgeable and personable. Although I was initially put off by the chatty tone and endless personal details that mark the beginning of the book, I found myself gradually captured by the purpose and the logic of the book when that finally emerged after several chapters. In short, this is a book that succeeds in spite of its flaws.

Phritz says

I enjoyed this book. I've never read anything about bio-geography before. The author spends ample time on field work, covering areas like New Caledonia, New Zealand, Madagascar, Hawaii, Central America, and many other locals. He dives into the details and taxonomy of numerous species and conveys the role of bio-geographical sleuth. All and all, this book is worth reading.

My gripes with this book are secondary. To put it briefly, Alan de Queiroz' book is, in my opinion, a work in progress in the realm of popular science. Alan's tack is to lead with a strong thesis. This is a book that attempts to convince the reader that dispersalism, the notion that trans-oceanic crossings of large mammals, such as monkeys, played a major role in populating the Americas and other far flung land masses with a

shared set of fauna.

The author leads very strongly with his theory. Often this is a good approach for a popular science book. It can be exciting and motivate the more technical aspects of the subject. But, to engage the reader, the author needs to anticipate the reader's questions and provide appropriate arguments. I feel that there are a lot of holes in Alan's book. For example, early on he makes reference to a back of the napkin estimate of the number of monkeys that may of reached South America by floating across the ocean. Given so many millions of years, it seems likely that this event must have happened multiple times. As a lay person, my first thought is, yes, but did these events happen in sufficient proximity in time and space so that the various populations met, interacted, and interbred? What is a sufficient seed population size to create a self-sustaining population and serve as a healthy start for a new species? Perhaps these questions have obvious answers to an expert in the field, but they certainly do not for me.

I certainly do not pretend to understand bio-geography to the extent the author does (in fact his book introduced me to the field). I do think, however, that the author could better engage a lay audience by framing his argument in a tighter fashion and engaging the reader by better anticipating questions the lay person is likely to have.

Michael Crawford says

This book had much less monkey than I was expecting. The monkey doesn't appear until 200+ pages into the book. Then the bomb drops, a small bomb IMO. Our family of monkey likes to take cruises. As do many other animals.
The big point her is that the earth is rediculously old. The evolution of its life forms takes time and includes many extinctions.
The second big point is that maybe the crust plates shifting separated animal species, but those animals are extinct and the surviving species are not necessarily on the same place. These animals have the ability, albeit rare, to disperse across large bodies of water and populate far away continents.
This is his story behind the monkey. A short story. One that explains why there are different types of monkeys in the the new world vs the old world. Monkeys with different traits. Monkeys that didn't exist when the plates initially shifted.
Cool stuff, skimmed parts just to get to the juicy parts. Nice writing style.

Louise says

4 Stars

A lot more heavy on the scientific theory and history of science than I was expecting. I guess I thought it would mostly be a collection of stories about remarkable animal/plant dispersals, but is actually more of a manifesto for the legitimacy of chance dispersal as *the* driving force behind the history of life with a few example case studies and lots of history on the scientific arguments for and against.

Utterly fascinating, but then I am a massive nerd.

Maxine says

How is it that similar species can be found as far away as Africa and South America? This question has been raging at least since Charles Darwin. Until then, the generally accepted answer was God. Darwin, on the other hand, believed that it was caused by dispersal – seeds and insects carried on birds' feet or on floating debris or even icebergs in the ocean – and experimented with radish seeds and sticks to prove his theory. That theory was fine for small insects and plants over short distances but what about longer distances and bigger animals like, say, monkeys. It would take a miracle for a monkey to survive the trip from Africa to South America and scientists rarely believe in miracles.

Then in the 1960s, the theory of tectonic plates and continental drift was proven, leading to a more scientific solution – vicariance which is when a georgraphical area breaks into separate parts creating a barrier between members of species so that the disparate members then evolve differently (*phew* I hope I got that right). When Gondwana, the supercontinent in the southern hemisphere, broke apart, monkeys and other species of plants and animals were left to follow different evolutionary paths on opposite sides of the world. This made more sense than Darwin and his 'damned, benighted dispersalism' and so dispersalism was tossed on the trash heap of scientific history never to be considered by rational scientists again.

Well, no, not never because, within a couple of decades, new scientific discoveries were making the theory of vicariance less tenable. According to the vicariance argument, Africa and South America split 100 million years ago but molecular-clock studies show that African and South American monkeys didn't split until just 30 – 50 million years ago. Plus, monkeys didn't appear in South America until 26 million years ago according to author Alan de Querioz, "as if out of thin air".

So what is the explanation? Well, as it turns out, de Querioz makes a pretty compelling argument that perhaps scientific miracles, or at least near-miracles, do happen. According to him, the answer is "land rafts', which periodically break off from continents and drift over very long distances. When the first monkeys arrived in the new World some 40 million years ago, the Atlantic was only 900 miles wide. With strong winds and currents, the trip could have taken as little as a week.

The Monkey's Voyage is a fascinating attempt to explain not only the evolution of species but the evolution of scientific thought. Along with the science, de Querioz peppers the book with some often funny anecdotes about the men behind the science. His writing style is open, intelligent, honest (he admits when the evidence doesn't match the theory) and, at times humourous, making the science easily accessible and, dare I say, fun.

Disclaimer: I am not a scientist so don't go by anything I have written. Read the book, instead, because, in simple layman's terms (ie. Mine) it's one heck of an interesting read.

Chris Branch says

A engagingly written discussion of the debate about whether the evidence favors vicariance or long distance dispersal as the explanation for the distribution of living things around the world.

There may indeed have been some cases of vicariance, in which an ancient species was separated by continental drift and subsequently evolved into separate modern species. But de Queiroz makes a convincing

argument that this is actually a more rare occurrence than the seemingly improbable voyages of plants and animals across vast expanses of ocean to populate remote islands.

While there have always, since Darwin, been people who believed in the possibility of long distance journeys, the weight of consensus has swung back and forth over the years. The recent decisive factor that de Queiroz argues has settled the case is the possibility of molecular dating of DNA. This shows that, for example, the species that populate Hawaii have evolutionarily separated from their related mainland populations as recently as 20 million years ago, not 70 million as would have to be the case for the islands to have been close enough to any continent for normal (short distance) dispersal.

There is quite a bit of scientist vs. scientist debate discussed here, with competing theories spelled out and then refuted, I suppose to add the element of human drama to the book, but for me that part got a little tedious, and was less interesting and relevant than the actual evidence presented.

One of the most interesting things I learned from this book was the concept of the "how-possibly explanation" originated by an obscure philosopher of history named William Dray. It's a series of arguments aimed at overcoming the incredulity of the audience, so that in the end it's been demonstrated that a particular event was clearly not impossible, even though it may not have been probable, and may not have happened in exactly the suggested way.

Glad I read this one, recommended.

Ryan says

A quite detailed discussion on the history of biogeography, from it's origins as a co-topic of evolution in the 19th century, through the important breakthrough given by the discovery of plate tectonics and finally to the recent advances in molecular 'time clock' techniques of constructing phylogenetic trees. It includes a large cast of scientists and thinkers, their debates and infighting within academia on the validity of vicariance biogeography (distribution explained by continental drift) versus oceanic dispersal. The latter, seemingly random and unscientific, is argued by the author as the only plausible explanation remaining after eliminating other reasons, as scientists are able to date the divergence of species more and more accurately, revealing that most lifeforms evolved on islands and continents like New Zealand post, not pre-separation.

The case for dispersal as the main explanation for the current distribution of life on Earth is painstakingly built up over the length of the book, which often has a rather dry academic tone and becomes too technical for the layperson to follow, but the conclusions are profound and worth ploughing through to reach. He rightly presents case studies in order of believability and likelihood, from easy to swallow cases of plants colonizing different continents and invertebrates that float across oceans carried by jet streams, to reptiles and amphibians adrift on natural floating debris reaching islands 'near' mainland, and finally to the more amazing voyages that monkeys must have taken across the Atlantic to reach the New World. Finally, the book ends by contemplating the importance of random events in shaping the biota of the planet, ourselves included. This last bit is not so earth shattering considering the common knowledge that mammals only managed to dominate after the demise of dinosaurs, while life on Earth itself is highly improbable in any case given the sheer number of planets in the universe!

Like some other readers, I am not totally convinced of the more dramatic cases of large vertebrates crossing oceans. Seeds and tiny insects drifting with the wind and water currents is one thing, monkeys surviving on

mini-islands adrift for months is quite another. If the latter indeed happened between the 900 odd miles separating Africa and South America 40 mya, wouldn't the crossing of Wallace's line, a comparatively neglible distance of a few miles be mere child's play, and monkeys inhabit New Guinea and Australia today?

Ben Babcock says

So, there are monkeys in South America and in Africa. How did they get there? That's essentially what Alan de Queiroz wants to answer in *The Monkey's Voyage: How Improbable Journeys Shaped the History of Life*, albeit in a roundabout way.

If you're a creationist, especially a young-Earth creationist, you don't have to worry too much about this. The answer is "God did it!" (Or possibly, "God did it, praise Jesus!" if you are feeling particularly devout at the moment.)

Alas, I am not a creationist, so I have to look to science for an answer.

In school, I learned that **the continents move**. I know, right? But it's a real phenomenon, called continental drift, and it's powered by this even cooler phenomenon called plate tectonics. Unlike the way we learned it in school, though, the discoveries of drift and plate tectonics didn't go smoothly. There were a lot of bumps in the road, as de Queiroz recounts.

But what about those monkeys? Well, the problem is that South America and Africa were last connected millions of years *before* the New World and Old World monkeys became separate species. What's up with that? Did they pull a human-migration and come down through a Siberian land bridge? Why aren't there any monkey fossils in Canada, then?

Because they floated on tree rafts.

Mind. Blown.

I've said it before; I will say it again. Science is awesome. Science does *not* remove wonder from the equation; **science amplifies the wonder**. If there is anything more wonderous than the ponderous million-year movements of continents, it's the image of intrepid animals, clinging to an impromptu raft of floating trees and soil as the currents carry them towards another continent or an oceanic island far offshore.

This is essentially the sentiment de Queiroz tries to convey with *The Monkey's Voyage*. He certainly shows off his own passion for science and wonder for nature in his personal anecdotes about trips to New Zealand and throughout the United States. His narrative is complicated by the fact that, unlike, say, plate tectonics or global warming, this theory of **biogeographic long-range dispersal** through things like rafts, birds, etc., is not yet a consensus. There is still a strong contingent of scientists who believe that long-term dispersal plays no role in the distribution of species and support an all-out theory of vicariance—distribution via continental drift and more conventional, shorter-duration dispersal.

But this is a brand of exciting in itself. So many science books present scientific discoveries to readers as a *fait accompli*: "Look at this wonderful shiny theory! Look at all this evidence we have! All the other competing theories have bitten the dust!" And then there is much champagne-opening and sexy partytimes. (Except there is no sexy partytimes, because scientists do not get invited to those sorts of parties.) Instead,

The Monkey's Voyage involves some very cutting-edge, very much "of the moment" science. De Queiroz is obviously confident enough in disperalism to have written this book, but he diligently presents both disperalist and vicariance views, as well as the many and sundry perspectives within these camps. (I should mention that de Queiroz isn't saying that dispersal or vicariance exclusively explains the distribution of species. Rather, he chronicles the changing opinion within the scientific community from primarily-vicariance to vicariance-and-dispersal.)

De Queiroz says that he hopes "to explain what this dramatic shift in thought tells us about both the nature of scientific discovery and the history of life on a grand scale", and in this respect I think he succeeds admirably. I've read a lot of history of science books, and they often explain how scientific exploration and discovery has changed over the centuries (usually by using words like *rigorous*). They seldom paint a good picture of what it was like to do science in the twentieth century, however, by which time philosophies of science and the scientific process were well-entrenched, sometimes dogmatically. With occasional shout-outs to Popper and Kuhn, de Queiroz looks at how people's attitudes towards scientific discovery have coloured their own approaches to this biogeographic discussion. He challenges the myth that science is a monolithic thing; at the same time, he shows how all scientists are still working within a common, loose framework and towards the same goal of knowledge validated by evidence.

Still, I hesitate to call *The Monkey's Voyage* a *popular* science book. It gets far more technical than I would expect the average lay-person to want to follow. I consider myself a fairly literate person, in terms of science, and I found de Queiroz's explanations hard to follow at times. It isn't just the jargon—which he acknowledges as a potential obstacle and tries to minimize—but also a problem of organization. He chunks things like a scientist, anticipates counterarguments and carefully comes up with ways rebuttals, until the result is a little too convoluted. The actual eponymous monkey chapter is buried far towards the end of the book and quite short compared to the rest.

Don't let this deter you from reading the book if the subject still interests you. Despite the higher barrier to entry, it remains fascinating and well-written. It's about a subject that is contemporary and still developing within the scientific community, and I think that's very exciting. De Queiroz encourages us to think about how life has evolved along with the changing face of the planet, and that's a very intriguing idea. It's definitely worth a book or two. If all you are after is a light, pop sci read, then *The Monkey's Voyage* will not hold your attention. But if you really want some meaty biogeography for your weekend, then Alan de Queiroz has got you covered.
