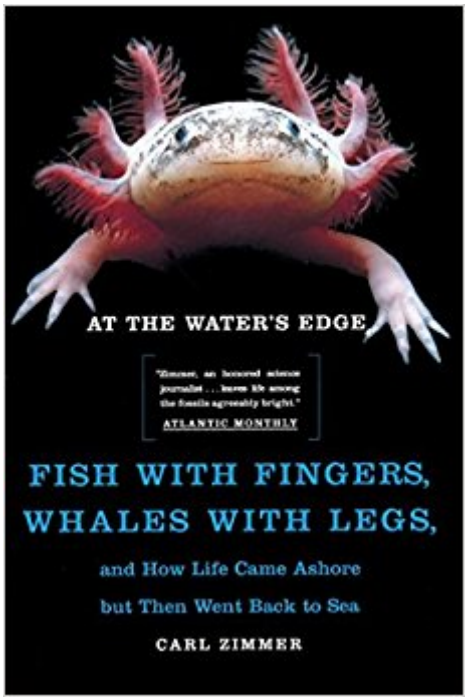
At The Water's Edge: Fish With Fingers, Whales With Legs, And How Life Came Ashore But Then Went Back To Sea



Synopsis

Everybody Out of the Pond At the Water's Edge will change the way you think about your place in the world. The awesome journey of life's transformation from the first microbes 4 billion years ago to Homo sapiens today is an epic that we are only now beginning to grasp. Magnificent and bizarre, it is the story of how we got here, what we left behind, and what we brought with us. We all know about evolution, but it still seems absurd that our ancestors were fish. Darwin's idea of natural selection was the key to solving generation-to-generation evolution -- microevolution -- but it could only point us toward a complete explanation, still to come, of the engines of macroevolution, the transformation of body shapes across millions of years. Now, drawing on the latest fossil discoveries and breakthrough scientific analysis, Carl Zimmer reveals how macroevolution works. Escorting us along the trail of discovery up to the current dramatic research in paleontology, ecology, genetics, and embryology, Zimmer shows how scientists today are unveiling the secrets of life that biologists struggled with two centuries ago. In this book, you will find a dazzling, brash literary talent and a rigorous scientific sensibility gracefully brought together. Carl Zimmer provides a comprehensive, lucid, and authoritative answer to the mystery of how nature actually made itself.

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Customer Reviews

I’ve thought that evolution was the best explanation for the similarities among lifeforms since I was a young child, always it seemed that the many many books arguing evolution were simply stating what was assumed and obvious. Well... once again, the world is deeper than ever I dreamed. This book views what’s happened in science and explains ideas and new discoveries clearly and interestingly (even to me a non scientist). A great book to read and think about. The author also wrote "ParasiteREX" and "Microcosm" both landmark excellent books.

This is the first book I have read by Carl Zimmer, so I didn’t know what to expect. When I first read the title and thought about the subject matter, I assumed this book would be somewhat drab to me. To the contrary, I found Zimmer’s coverage of the subject quite interesting, and I was pleasantly surprised by his thorough coverage of this subject. But let’s face it, the transition from water to land, and back again in some cases, are really pivotal periods in evolutionary history. It is important to have a grasp on what exactly happened here. If that is of any significance to you, Carl Zimmer has done a brilliant job of explaining the history.Zimmer takes us on a remarkable journey through time attempting to piece together the available evidence to make sense of the transition of life from water to land. In chapter two, he introduces a concept known as exaptation, which captures the idea of an evolutionary adaptation that is later co-opted for different use later on. It seems likely that many functions employed by the land-based tetrapods may have been in development long before they began their adventures on land. I enjoyed the detailed explanation of the development of limbs and hands in chapter three; I thought this material was well presented. For example, Pere Alberch and Neil Shubin noticed a sequence in the development of limbs - each one formed by the same short chain of events. They could actually sketch out the growth with a set of symbols, delineating the development of a limb like a sentence. This came to be called the homology of growth. It explains why you never see triple thighs or other such anomalies; the branching rules just don’t allow for it. In chapter four, yet another powerful concept is introduced - correlated progression, where change in one character (feature or attribute of an organism) may influence change in another, such that the rate of change of the two characters is not independent. He continues on with an explanation of lung evolution and the development of amniotes.From chapter five on, the discussion turns to the cetaceans (large aquatic mammals such as dolphins and whales). Evidence indicates that these creatures actually descended from land animals. Zimmer provides an in-depth analysis of the

evolutionary history of the whale from the early Archaeocetes (meaning ancient whales) such as Pakicetus to the present day cetaceans.When reading this book, one must keep in mind that it was written in 1998. Today, in 2012, we have fourteen years of additional research and advances that change the picture somewhat. Zimmer alluded to these future developments in chapter nine when describing the conflict in findings between the fossil record and the emerging field of molecular phylogeny (the craft of building gene trees) at that time. Whales were thought to have descended from the mesonychians, an extinct group of hoofed carnivores. However, evidence since then, and the emerging genetic data of that time indicate a relationship to the artiodactyls instead. Nevertheless, there is such a wealth of historical data presented that it is still definitely worth the read.

At The Water's Edge is about about the evolution of large and important changes in species; Zimmer focuses on change in habitat, the move from sea to land, and then back to sea.Zimmer begins by describing different fish lineages and concentrates on the branch that leads to our own chordate subphylum, the tetrapods. How and why did legs evolve? How did our left and right walking motion appear? Zimmer reveals a surprising answer. Tetrapods, legs, and walking did not evolve to help fish survive on land; they evolved to help fish swim in shallow swampy river deltas at the ocean's edge. These features allow fish to move more efficiently among the river plants and to sneak up on prey more easily. Once the left right motion was established, it was easy for fins to strengthen. At some point there came a need to move from puddle to puddle, or perhaps to escape predators, or to lie in wait out of the water. Strong alternating fins, which had evolved in a purely aquatic environment, were ideally suited to these new tasks.To emphasize this original unplanned use of an existing feature, Zimmer uses Stephen Jay Gould's strange neologism "exaptation" rather than a more familiar term like pre-adaption. Zimmer prefers exaptation because pre-adaptation somehow implies that the final use of a thing was planned from the beginning. Zimmer emphasizes that it was not.Once he's done with how tetrapods appeared and then came to land, Zimmer makes an about face and returns to the seafollowing whales and dolphins. Here too we find surprises. Early whale ancestors probably behaved like crocodiles and alligators. They would stay in the water with only their eyes and nose protruding, waiting for a land based prey to come close. Later, Zimmer describes echolocation, one of the most complex and useful features of cetaceans. Dolphins and many whales have a superb sonar system that works by echoing clicks out and back in through a fat-filled cavity in their forehead called the melon. The melon acts as a sound lends letting dolphins "see" small objects hundreds of feet away. How can such a useful and complex organ evolve? The

current hypothesis is that the melon’s first function in early whales was simply to block the nasal passage during deep dives, to keep water out. Once it existed, it probably provided very rudimentary echolocation which gave natural selection something to work with. Another exaptation.Another topic Zimmer touches often is cladism, which is the sorting of species into a genealogical table by identifying key features. Features common to a group of species can imply a common ancestor even if we haven’t found any trace of the ancestor itself. Two cladistic schools are at this moment fighting it out: the biological and morphological school one side, and the genetic school on the other. The schools often arrive at different conclusions. The strength of the biological school is that its discoveries are practical; key features mean something concrete like a backbone (chordates) or a melon (dolphins and many whales). However, key features are very difficult to identify. Genes on the other hand are easy to identify and to compare among different species. Also, there’s a mechanical logic to genes that readily lends itself to cladistic sorting. However, genes often don’t mean anything, i.e. have no effect on how the organism works, and they can mutate at random, appearing and disappearing for no reason. Each camp will probably have to find a way to learn from the other.Charles Darwin famously called his Origin of Species "one long argument", by which he sought to establish Natural Selection as the main means of evolution. You might take Zimmer’s book as one short argument to establish exaptations and cladism as the main engines of macroevolution.

If you are of a scientific bent, and enjoy detective stories, this is the book for you. It’s not written in a "whodunnit" style, but it follows the path of scientists ferreting out the "whodunnit" of evolution. The pieces of the puzzle are chipped out of rock and fit together, by diligence, luck, insight and sometimes coincidence.The book does include biology and science that makes it (in my opinion) unsuited for people with just a passing interest in this subject. It’s not super technical, but if you don’t have the backround or deep interest to follow it you’re likely to get a headache or have your eyes glaze over.This book is right up my alley and following the science of it was exciting and fun.

Zimmer is the best!

Guide, Unique Smoking Fish Recipe Book, Smoking Meat, BBQ Cookbook) Pure Water: The Science of Water, Waves, Water Pollution, Water Treatment, Water Therapy and Water Ecology Smoking Meat: Fish Edition. : Delicious Smoking Fish Recipes for Everyone (Book 2, Smoked Fish Recipes Cookbook, Smoked Fish Guide, Unique Smoking Fish Recipe Book, Smoking Meat, BBQ Cookbook) Draw 50 Sharks, Whales, and Other Sea Creatures: The Step-by-Step Way to Draw Great White Sharks, Killer Whales, Barracudas, Seahorses, Seals, and More... Back Stretching: Back Strengthening And Stretching Exercises For Everyone (lower back pain, healing back pain, stretching exercises, back pain treatment, ... pain relief, stretching, back pain Book 1) Living in Italy: The Real Deal. Hilarious Expat Adventures of a Couple Intent on Living Their Dream Life. But Then Things Went Horribly Wrong! "Laugh Out Loud Page Turner" What Pet Should I Get? and One Fish Two Fish Red Fish Blue Fish Robotic Fish iSplash-MICRO: A 50mm Robotic Fish Generating the Maximum Velocity of Real Fish (High Speed Robotics. Mechanical engneering and kinematics for maximum velocity robot fish. Book 4) One Fish Two Fish Red Fish Blue Fish (I Can Read It All by Myself) Poisson Un Poisson Deux Poisson Rouge Poisson Bleu: The French Edition of One Fish Two Fish Red Fish Blue Fish (I Can Read It All by Myself Beginner Books (Hardcover)) One Fish Two Fish Red Fish Blue Fish (Beginner Books(R)) Legs that Won't Quit : 30 Days to Slimmer Sexier thighs and Legs Attract Women: Unlock Her Legs: How to Effortlessly Attract Women and Become the Man Women Unlock Their Legs For (Dating Advice for Men to Attract Women) The War for Late Night: When Leno Went Early and Television Went Crazy Water Clarity Secrets for Ponds and Water Gardens: The Quick and Easy Way to Crystal Clear Water (Water Garden Masters Series Book 5) Fruit Infused Water - 80 Vitamin Water Recipes for Weight Loss, Health and Detox Cleanse (Vitamin Water, Fruit Infused Water, Natural Herbal Remedies, Detox Diet, Liver Cleanse) Here Shall I Die Ashore: STEPHEN HOPKINS: Bermuda Castaway, Jamestown Survivor, and Mayflower Pilgrim. Washed Ashore