

## Fish out of water

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Adapted from *Your Inner Fish* by Neil Shubin © 2008. Reprinted with permission by Pantheon Books, a division of Random House, Inc. Shubin, Chicago's Robert R. Bensley professor, chair and associate dean for Organismal Biology & Anatomy, is also provost of the Field Museum of Natural History.

Hernias, hiccups, and snores—oh, my! It's been 3.5 billion years, and the human body's past still plays a role in our lives and health.

My knee was swollen to the size of a grapefruit, and one of my colleagues from the surgery department was twisting and bending it to determine whether I had strained or ripped one of the ligaments or cartilage pads inside. This, and the MRI scan that followed, revealed a torn meniscus, the probable result of 25 years spent carrying a backpack over rocks, boulders, and scree in the field. Hurt your knee and you will almost certainly injure one or more of three structures: the medial meniscus, the medial collateral ligament, or the anterior cruciate ligament. So regular are injuries to these three parts of your knee that these three structures are known among doctors as the "Unhappy Triad." They are clear evidence of the pitfalls of having an inner fish. Fish do not walk on two legs.

Our humanity comes at a cost. For the exceptional combination of things we do—talk, think, grasp, and walk on two legs—we pay a price.

This is an inevitable result of the tree of life inside us. Imagine trying to jerry-rig a Volkswagen Beetle to travel at speeds of 150 miles per hour. In 1933 Adolf Hitler commissioned Dr. Ferdinand Porsche to develop a cheap car that could get 40 miles per gallon of gas and provide a reliable form of transportation for the average German family. The result was the VW Beetle. This history, Hitler's plan, places constraints on the ways we can modify the Beetle today; the engineering can be tweaked only so far before major problems arise and the car reaches its limit.

In many ways, we humans are the fish equivalent of a hot-rod Beetle. Take the body plan of a fish, dress it up to be a mammal, then tweak and twist that mammal until it walks on two legs, talks, thinks, and has superfine control of its fingers—and you have a recipe for problems. We can dress up a fish only so much without paying a price. In a perfectly designed world—one with no history—we would not have to suffer everything from hemorrhoids to cancer.

Nowhere is this history more visible than in the detours, twists, and turns of our arteries, nerves, and veins. Follow some nerves and you'll find that they make strange loops around other organs, apparently going in one direction only to twist and end up in an unexpected place. The detours are fascinating products of our past that, as we'll see, often create problems—hiccups and hernias, for example. And this is only one way our past comes back to plague us.

Our deep history was spent, at different times, in ancient oceans, small streams, and savannahs, not office buildings, ski slopes, and tennis courts. We were not designed to live past the age of 80, sit on our keisters for ten hours a day, and eat Hostess Twinkies, nor were we designed to play football. This disconnect between our past and our human present means that our bodies fall apart in certain predictable ways.

Virtually every illness we suffer has some historical component. The examples that follow reflect how different branches of the tree of life inside us—from ancient humans, to amphibians and fish, and finally to microbes—come back to pester us today. Each of these examples show that we were not designed rationally but are products of a convoluted history.