

Evolution

Iman Shepard

Lake Forest College

Lake Forest, Illinois 60045

In Neil Shubin's *Your Inner Fish: A Journey into the 3.5-Billion-Year History of the Human Body*, Shubin, a paleontologist and anatomy professor, discusses his findings of *Tiktaalik* and uses analogies as well as his own personal experience to unfold the basic concepts of evolution. The entire book is an account of evolution, but there are specific instances as well.

Evolution drives the diversity and unity of life. The first chapter of the book, "Finding Your Inner Fish", introduces *Tiktaalik* as well as the part that fossils play in determining relationships between organisms. *Tiktaalik* displays qualities similar to a fish and a land animal, signaling that it is a transitional fossil between the two, further supporting evolution. Shubin also uses the analogy of walking through a zoo to exhibit the similarities that can be seen between creatures simply by observing their features. He claims, "All the living things can be organized and arranged like a set of Russian nesting dolls, with smaller groups of animals comprised in bigger groups of animals" (Shubin, 2008, p. 12). Shubin uses the analogy of Russian dolls to explain the connections and subsets between the animals at the zoo and imitate evolution at a smaller, simpler scale. The zoo analogy also shows that the more phenotypically similar your traits are when compared to another animal, the more likely you are to be genetically related to them. Furthermore, within chapter nine, "Vision", the process of evolution can be seen through eyes. The similarities between organisms, such as opsin, which is the light-gathering molecule that is used in phototransduction to see black, white, and color, and Pax6, which is a transcription factor that is present during embryonic development and is a key regulatory gene in eye development, reveal the interconnection among varying organisms. Conversely, there are differences between organisms as well. For example, humans have developed a third photoreceptor in response to changes in the flora of the earth. Due to the increase in diversity of plants it became advantageous for monkeys to be able to distinguish between different types of fruits and leaves to determine the most nutritious and beneficial. This is a perfect presentation of evolution, because in response to an environmental trigger (change from monochromatic fruit to polychromatic), the development of a third photoreceptor occurred. Moreover, the presence of opsin and Pax6 serves to further exemplify evolution by linking organisms together. In addition to addressing evolution, Shubin explores biological systems.

Biological systems utilize free energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis. In chapter six, "The Best-Laid (Body) Plans" the development of embryos is explored. The similarities between the embryos of different species are present at the beginning of growth, but as time progresses, Shubin notes the differences between embryos. This connects back to the designation of energy within organisms. Within initial development, all free energy is designated towards growth, which can be seen through the differentiating between the embryos. Additionally, living systems store, retrieve, transmit, and respond to information essential to life processes.

In chapter eight, "Making Scents", the development and complexity surrounding the sense of smell is discussed. Shubin states, "Dolphins and whales no longer use their nasal passages to smell... the former nasal passage has been modified into a blowhole, which is used in breathing, not in smelling" (Shubin, 2008, p. 194-195). Shubin goes on to explain the silent mutation that must have occurred that led to the discontinued sense but remaining presence of genes that enable smelling. This demonstrates how living systems respond and adapt to the changing environment surrounding them. Biological systems contain complex properties that allow and disallow interactions.

Within chapter seven, "Adventures in Bodybuilding", the interactions and cooperation between a body's tissues and structures are explained. This section tackles the requirement for biological systems at a cellular interaction level within organisms to work to make an individual. Shubin explains, "Not every clump of cells can be awarded the honor of being called a body. A mat of bacteria or a group of skin cells is a very different thing from an array of cells that we would call an individual. This is an essential distinction" (Shubin, 2008, p. 156). Shubin is saying that for a body to work, cells must interact with each other to create an organism. Ultimately, Shubin uses easily understandable systems coupled with common analogies to demonstrate the connectedness of living systems.

I would recommend this book for an introductory evolution, ecology, or

environmental studies class. I think this book is a wonderful resource for the nonscientific/novice scientific community to begin to grasp fundamental evolutionary and biological systematic concepts.

References

Shubin, N. (2008). *Your inner fish : a journey into the 3.5 billion-year history of the human body*. Penguin.