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EDITORIAL NOTE

About Our Ancestral Connections to Early Bacteria and All Life In Between: Exceptional Topics and Exciting Possibilities for Teaching Children

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I had first read Neil Shubin's *Your Inner Fish: A Journey into the 3.5-Billion-Year History of the Human Body* during my early scholarship years as I was trying to understand the construct of, and possibilities within, early childhood environmental education. Now, about ten years later, I have reread the book with greater appreciation for its content and the many implications for guiding and teaching children in their journeys of environmental literacy development.

Reprinted with permission from Pantheon Books, the following is an epilogue in the book written in the words of a father (Neil Shubin himself, whose children were young at the time). The epilogue fittingly describes his experiences with his young children and then implies, at least for me, possible compelling areas of study in early childhood education, both of which are significant parts of the intersections addressed in this journal.

As a parent of two young children, I find myself spending a lot of time lately in zoos, museums, and aquaria. Being a visitor is a strange experience, because I've been involved with these places for decades, working in museum collections and even helping to prepare exhibits on occasion. During family trips, I've come to realize how much my vocation can make me numb to the beauty and sublime complexity of our world and our bodies. I teach and write about millions of years of history and about bizarre ancient worlds, and usually my interest is detached and analytic. Now I'm experiencing science with my children - in the kinds of places where I discovered my love for it in the first place.

One special moment happened recently with my son at the Museum of Science and Industry in Chicago. We've gone there regularly over the past three years because of his love of trains and the fact that there is a huge model railroad smack in the center of the place. I've spent countless

hours at that one exhibit tracing model locomotives on their little trek from Chicago to Seattle. After a number of weekly visits to this shrine for the train-obsessed, Nathaniel and I walked to corners of the museum we had failed to visit during our train-watching ventures or occasional forays to the full-size tractors and planes. In the back of the museum, in the Henry Crown Space Center, model planets hang from the ceiling and space suits lie in cases together with other memorabilia of the space program of the 1960s and 1970s. I was under the presumption that in the back of the museum I would see the trivia that didn't make it to the major exhibits up front. One display consisted of a battered space capsule that you could walk around and look inside. It didn't look significant; it seemed way too small and jury-rigged to be anything really important. The placard was strangely formal, and I had to read it several times before it dawned on me: here was the original Command Module from Apollo 8, the actual vessel that carried James Lovell, Frank Borman, and William Anders on humanity's first trip to the moon and back. This was the spacecraft whose path I followed during Christmas break in third grade, and here I was thirty-eight years later with my own son, looking at the real thing. Of course it was battered. I could see the scars of its journey and subsequent return to earth. Nathaniel was completely disinterested, so I grabbed him and tried to explain what it was. But I couldn't speak; my voice became so choked with emotion that I could barely utter a single word. After a few minutes, I regained my composure and told him the story of man's trip to the moon.

But the story I can't tell him until he is older is why I became speechless and emotional. The real story is that Apollo 8 is a symbol for the power of science to explain and make our universe knowable. People can quibble over the extent to which the space program was about science or politics, but the central fact remains as clear today as it was in 1968: Apollo 8 was a product of the essential optimism that fuels the best science. It exemplifies how the unknown should not be a source of suspicion, fear, or retreat to superstition, but motivation to continue asking questions and seeking answers.

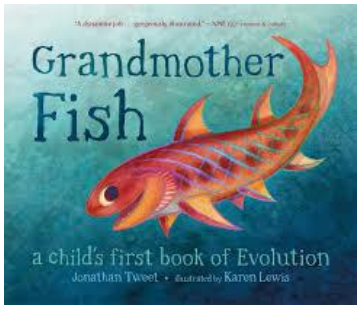
Just as the space program changed the way we look at the moon, paleontology and genetics are changing the way we view ourselves. As we learn more, what once seemed distant and unattainable comes within our comprehension and our grasp. We live in an age of discovery, when science is revealing the inner workings of creatures as different as jellyfish, worms, and mice. We are now seeing the glimmer of a solution to one of the greatest mysteries of science - the genetic differences that make humans distinct from other living creatures. Couple these powerful new insights with the fact that some of the most important discoveries in paleontology - new fossils and new tools to analyze them - have come to light in the past twenty years, and we are seeing the truths of our history with ever-increasing precision. Looking back through billions of years of change, everything innovative or apparently unique in the history of life is really just old stuff that has been recycled, recombined, repurposed, or otherwise modified for new uses. This is the story of every part of us, from our sense organs to our heads, indeed our entire body plan.

What do billions of years of history mean for our lives today? Answers to fundamental questions we face - about the inner workings of our organs and our place in nature - will come from understanding how our bodies and minds have emerged from parts common to other living creatures. I can imagine few things more beautiful or intellectually profound than finding the basis

for our humanity, and remedies for many of the ills we suffer, nestled inside some of the most humble creatures that have ever lived on our planet.

The following children's picture and story books may be helpful as you introduce and discuss with children about the basis for our humanity. As children inquire further, it would be helpful then to engage them in more in-depth studies or projects. Our interconnectedness and interdependence with all natural systems are obviously difficult subjects and challenging to fully understand given the immensity of it all (for example, see https://naturalstart.org/research/ijecee/volume-7-number-1) - start we must, though, given that, in the words of Shubin (2008), we "live in an age of discovery" (p. 200) and that "what once seemed distant and unattainable comes within our comprehension and our grasp" (p. 200). While appropriately and respectfully engaging children, perhaps we too can guide children in finding the "basis for our humanity... inside [and alongside] some of the most humble creatures that have ever lived on our planet" (p. 201).

Grandmother Fish: A Child's First Book of Evolution by Jonathan Tweet (2016)
Illustrated by Karen Lewis

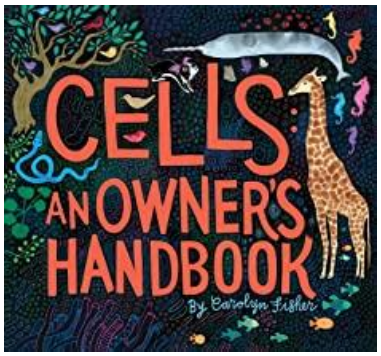


This picture book can serve as an impetus for conversations with preschool-aged children about ideas of "family" beyond human relatives. Conversations related to raising awareness that people are part of nature and that all life forms are connected and related to each other can, and should ideally, occur on an ongoing basis.

Who Will It Be? How Evolution Connects Us All by Paola Vitale (2020)
Illustrated by Rossana Bossù

Suitable for preschoolers and early elementary aged children, this picture book illustrates a growing human embryo and that it contains parts of amphibian, bird, fish, and reptile. The book explains that all life forms started from single cells that lived in the earth's oceans about four billion years ago.

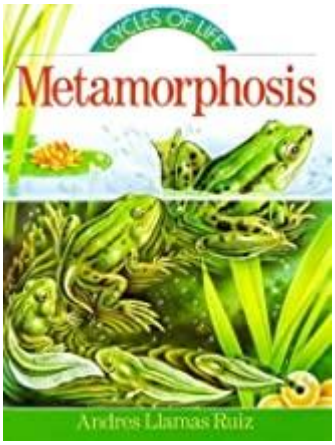
Cells: An Owner's Handbook by Carolyn Fisher (2019)
Illustrated by Carolyn Fisher



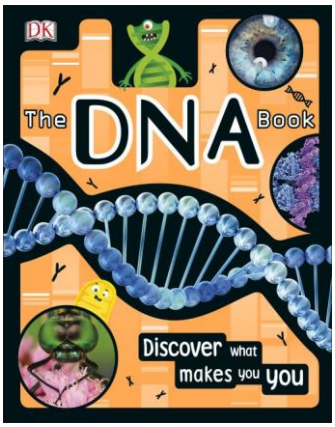
This picture book extends conversations about cells and is suitable for children in kindergarten and onwards. The book describes and illustrates what cells are, where they can be found, and what cells do. The book highlights that each of us "are the lucky owners of 37 trillion high-performance cells (give or take a few trillion)" and introduces vocabulary such as mitochondria.

Metamorphosis by Andres Llamas Ruiz (1996)
Illustrated by Francisco Arredondo

This picture book is better suited for listeners or readers of early elementary age and later. The book explains "what" metamorphosis means as well as both "how" different animals transform themselves from one form to another and "why" animals change forms. The book also introduces vocabulary related to animal adaptations, functions, and life cycles, particularly of pond animals such as dragonflies and frogs.



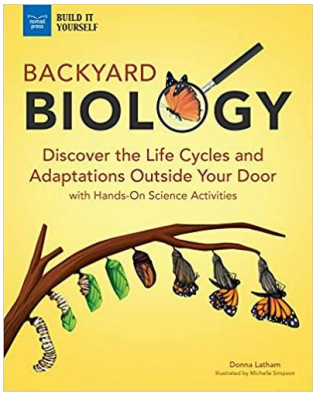
The DNA Book: Discover What Makes You You by Allison Woollard and Sophie Gilbert (2020)
Illustrated by Mark Clifton and Bettina Myklebust Stovne



This book is also better suited for children in the latter range of the early childhood years and onwards. The book is filled with pictures and explanations about what DNA is (molecule containing code for life) and what it can do (guide how each living thing grows, survives, and reproduces). The book introduces the idea of "mutations" in DNA as basis for why living things evolve and how living things may live and look.

Backyard Biology: Discover the Life Cycles and Adaptations Outside Your Door with Hands-On Science Activities by Donna Latham (2020)
Illustrated by Michelle Simpson

Better suited for later elementary aged children and onwards, the book provides many suggestions and illustrations for studying life forms. From watching the locomotion of single-celled amoebas to planting pollinator gardens, the book provides ideas for a varied range of learning activities related to understanding the many ways life is interconnected and interdependent.



And as Shubin has implied, learning experiences and studies in paleontology, too, are significant components in understanding life's development and processes for both children and adults alike. With these types of topics of study, many exceptional investigations and exciting variety of learning opportunities await children, everyone, and everything involved in guiding and teaching children. For examples how children may be engaged in such in-depth studies, access the following articles illustrating the study of human body (https://ecrp.illinois.edu/v10n2/brouette.html), human bones (https://ecrp.illinois.edu/v5n1/kogan.html), and study of insects and organisms that depend on trees (https://ecrp.illinois.edu/v17n1/griebling.html) by young children.

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