THANKFUL FOR THE EARTH'S SHIFTING WAYS

Consider the sampling of biodiversity at a Thanksgiving feast. The humans, the turkey, the potatoes, the cranberries and the pumpkin. All came from a physical cradle of life, the Earth.

This year, the changing Earth is getting serious respect for being the prime mover of organic evolution. For this I am thankful.

Now, consider the staggering biodiversity of the western Amazon, which includes parts of Peru, Bolivia, Columbia and Brazil. There, in a small portion of the globe, you will find at least 10 percent of Earth's living things. There, in an area the size of a large suburban house lot, you will find as many as 300 different tree species. This is comparable to the tree diversity found in all of eastern North America, according to Christopher Dick, an evolutionary ecologist from the University of Michigan.

And to what do we owe this living wealth? The "uplift of the Andes," concludes geologist Alexandre Antonelli of the University of Gothenburg, Sweden. This idea was presented in Baltimore last month at the annual meeting of the Geological Society of America, which I attended. A preview of this work was published as a feature article, "Cradle of Life," in the Oct. 30 issue of Science. In it, author Lizzie Wade reviews three distinctly geological explanations for the Amazonian biodiversity.

The first arrived in 1969, the year I started college. I distinctly remember it being proposed. Ornithologist Jurgen Haffer claimed that dry and wet periods associated with the growth and decay of ice sheets during the past 2 million years fragmented and reblended the forest habitat, accelerating speciation in refuges. This climate change theory was refuted in 1990, based on an improved statistical analysis and a fossil record showing that forests were always present.

Since then, two alternative explanations have been proposed. One argues that today's western Amazon was, about 10 million years ago, an embayment of the Caribbean Sea following a downward flexure of the crust. In this version, rapidly changing estuarine conditions -- wet, dry, saline, fresh -- were responsible for fragmenting habitats. This accelerated evolution, bringing us unusual species such as freshwater dolphins, stingrays and clams that closely resemble their marine counterparts.

Another explanation hearkens back to the late 18th century scientific ideas of Alexander Von Humboldt. This theory looks further west and further back in time to the rapid rise of the high Andes within the past 15 million years. This created a very steep mountain front to the east. Additionally, it added extra weight that bent the crust downward, creating a foreland basin now occupied by the western Amazon. In this theory, local climatic and hydrologic gradients (associated with steep mountains, freshly wrinkled topography, rapid valley erosion and rapid flood plain deposition) created a patchwork of habitats that accelerated speciation. Then, 7 million years ago, this foreland basin linked up with the Atlantic Ocean, creating the drainage system we know today, accelerating the pace of evolution even faster.

Most people don't look to the Earth itself for deeply satisfying explanations. Instead, they screech to a halt in the shallows of human culture. Far fewer people seek a deeper understanding of our cultural behaviors -- the terrible urgency of terrorism, the absurd comedy of politics and the banal frivolity of celebrity -- in our biological origins. We remain tribal clans of upright apes whose social brains have given us an amazing power for good and evil.
Rarer still are those seeking the root cause of everything we know, not in religion, but in the Earth itself. I am one of those people.

"No rocks. No ecosystem. No culture." This has long been the mantra for every course I teach. Everything we know on Earth ultimately comes from rock.

I'm thankful for the simplicity and honesty of that thought.