Yellowstone National Park holds soaring peaks, cascading waterfalls, steaming geysers, bubbling mudflats. Then there are the minuscule inhabitants that color the waters of Yellowstone hot pools. Though recognizable only under a microscope, the tiny critters embellish Yellowstone's diversity in astounding ways.

These microorganisms exist in huge colonies, each colony adapted for a different temperature zone found within the pool. For example, Grand Prismatic Spring's eye-catching colors, from vivid orange to deep azure, denote the result of multiple types of thermophilic (heat-loving) Archae that thrive in temperatures of 147 to 188 degrees Fahrenheit. These are organisms that have small, simple cells lacking nuclei.

A microorganism of a different sort makes a living in the superhot vents far below the surface. The scientific name of the bacterium, Thermus aquaticus, is shortened to Taq. Until Taq was discovered, humans believed life could not exist without sunlight.

Our existence is fueled by enormous amounts of energy intercepted from the sun. This happens through a chemical reaction involving one main molecule, chlorophyll, whose reaction with water and carbon dioxide produces sugar, which is the main fuel that powers life. The process is called photosynthesis. All living creatures, scientists postulated, partake of the sun's energy, either by generating photosynthesis or by eating the photosynthesizers.

In the late 1970s, the scalding hot pools of Yellowstone and the volcanic vents on mid-ocean ridges proved otherwise. There, scientists discovered Taq and its thermophile companions, all of them drawing their energy from the superheated waters. Thus began the study of bacterial aspects that had eluded us before.

Taken as a group, bacteria are the master chemists of our planet. Even the chemistry of human cells is largely borrowed from bacterial guest workers, writes Richard Dawkins in "The Ancestor's Tale," but even these feats are only a fraction of what bacteria are capable of achieving. Moreover, there are many more of them (in terms of biomass) than there are of multi-celled beings, trees to humans. The great majority of life's diversity is microbial, and a substantial majority of it is bacterial.

If plants and animals are treated as a pair of kingdoms, by the same standards there are dozens of microbial "kingdoms," each and all of them so unique, they are entitled to the same status as animals and plants.

Animals, plants, and fungi constitute but three branches on the tree of life. What distinguishes these three from those of microorganims: they are made of many cells. All the others are almost entirely microbial. Yet at the biochemical level, these others are astoundingly diverse. Many of the microbial dozens of kingdoms are as different from each other as the three known "kingdoms" of human classification. Dawkins provides a diagram of three main superkingdoms or "domains" of which animals and plants—humans don't even register—are part of Eukarya. Another domain comprises Eubacteria and yet another, Archaea.

Comparing genomes is one way of looking at diversity. Another is looking at the range of "ways of life," the trades, so to speak , that different life forms have carved out for themselves. Planet Earth's diversity is breathtaking.

From the biochemical point of view, koalas, moles, lions, and buffalos are doing much the same: they all derive their energy by breaking down complex molecules put together by energy from the sun that's captured by plants. Koalas and buffalos eat the plants directly; lions and moles get their solar energy at one remove, by eating animals that ate the plants. Without the massive inflow of energy from the sun, life would—so the textbooks used to say—grind to a halt. That's before we knew about thermophilic microorganisms that live in the superheated vents.

Today's animals and humans use oxygen that was (and is) produced by green plants and algae. But oxygen atoms were also present in earth's early atmosphere, not as oxygen gas but tied up in compounds like carbon dioxide and water. Carbon today is mostly locked up in living bodies (trees, plants, animals, humans)—or in certain rocks (chalk, limestone, coal) and petroleum, all consisting of the remains of once-living bodies.

Billions of years ago those carbon atoms would have existed in the atmosphere as compound gases such as carbon dioxide or methane. If humans burned all the fossil fuel in the world by tomorrow, much of the oxygen in the atmosphere would be replaced by carbon dioxide, restoring the planet to its ancient status quo. The only reason we have oxygen to breathe is that most of the carbon is tied up underground.

Love of high temperatures is far from rare among bacteria and archeans; in fact, it is quite common. Our familiar cool forms of life only very gradually evolved from it. When we dig down into the rocks, we dig backwards in time, rediscovering something of life's scalding beginnings. Today's scientists believe that life on Primitive Earth originated, not in the sea as was customarily thought, but deep underground, in the cracks of superheated rocks via hyperthermophilic bacteria.

Here are the words that Richard Dawkins puts forward as the tale of thermophilic ancestor Taq:

"Look at life from our perspective, and you eukaryotes will soon cease giving yourselves such airs. You bipedal apes . . . you vertebrated worms, you Hoxed-up sponges, you newcomers on the block . . . you are barely more than the fancy froth on the surface of bacterial life. Why, the very cells that build you are themselves colonies of bacteria, replaying the same old tricks we discovered a billion years ago. We were her before you arrived, and we shall be here after you are gone."

“We shall be here after you are gone.” When humans will have obliterated visible life via nuclear holocaust or irreversible environmental destruction, life will continue at microscopic levels. It’s a comforting thought.