Casper Star Tribune of October 10, 2015: “We are related to everything on Earth”
(WTE published this on Oct. 14, back to back with the marine-life column: **“We all had the same roots”**)

Scientists debate astounding things, but their musings are both interesting and instructive. For example, paleontologists wonder why, after three-plus billion years of microbial existence—as forms of algae, bacteria, amoeba—some of these single cells banded together to form elementary bodies. These aggregates, then, eventually evolved into complex systems like elephants, whales, and humans. Why did life not continue as single cells? Indeed, why are there bodies at all? How did—how could—bodies arise, and why didn’t they arise sooner?

The human body consists of about two trillion cells that are assembled in a very precise way. The same design is also part of the bodies of other creatures: fish, lizards, cows. We all have a front and a back, a head at the top, an anus at the opposite end of the mouth.

All our cells are held together by means of minuscule rivets. Astoundingly, all the cells have become specialized—bone cells, brain cells, skin cells—and they communicate with others of their kind to know what to do. Cells die and are sloughed off; new cells take their places. Each of our organs “knows” its place in the body and its size, although each changes continually. We grow in correct proportions because the growth of bones in our arms is coordinated with the growth of the bones in our fingers and our skulls. Much of the difference between a leg bone an an eye is how the cells are arranged deep inside.

Cells exchange information with one another through “words” written in molecules that move from cell to cell. As Neil Shubin explains in “Your Inner Fish,” one cell “talks” to the next by sending molecules back and forth. For instance, one cell will emit a signal—a molecule—that attaches to the outer membrane of the cell receiving the signal. Once attached, the molecule will set off a chain reaction that can travel all the way to the genetic information inside the nucleus. The cell receiving the molecular information now changes its behavior: it may die, divide, or make new molecules in response to the cue from the other cell.

How did all this coordinated activity come about? From the Human Genome Project and, lately, other genome projects, we know that these complexities are late arrivals in geologic time.

Professor Shubin uses the analogy of “earth year” to convey the vast geologic time-span and our minute tenure in it. In the “earth year,” the entire 4.5 billion history of the earth is scaled down to a single year, with January 1 being the origin of earth and midnight of December 31 its present. Until June, only single-cells organisms existed. The first animal with a head did not appear until October. The first human appears on December 31.

The fossil record tells us that, around 600 million years ago, creatures with many cells began to populate their primordial broth that became our oceans. These aggregates weren’t just colonies of cells that banded together: the creatures show patterns of symmetry that, in some cases, resemble those of living forms. Different parts of their bodies had developed specialized structures. Among the cell aggregates, a division of labor had begun.

For the first 3.5 billion years, life on earth consisted of nothing but microbes. That’s because a body is a very expensive thing to have. It requires more energy as it gets larger, particularly when it begins to manufacture collagen as an essential “glue.” So, why did cells start to come together, after their long tenure as solitary existences?

One theory is that bodies arose when microorganisms developed ways to eat each other. To avoid being eaten, it helps to be bigger. Bodies may have arisen as a kind of defense. Besides avoiding predators, the advantage to having a body is that animals with a body can eat other, smaller creatures.

Yet bodies incorporate collagen, and collagen requires large amounts of oxygen for its synthesis.

On the ancient earth, oxygen was very low, which means that for billions of years, bodies could not develop. This state of affairs changed around a billion years ago, when the amount of atmospheric oxygen increased dramatically; it has stayed relatively high ever since. Could the rise in oxygen in the atmosphere be a link to the origin of bodies? Dr. Shubin, puzzling the enigma, prods his colleagues toward insight and debate.

One thing becomes clear to readers who follow the professor’s reasoning: as humans we are related to every life forms on earth, from the modest sea sponge to the majestic sequoia. All are our distant cousins.

“Here is a humbling thought,” he writes, “for all of us worms, fish, and humans: Most of life’s history is the story of single-celled creatures.”

One phenomenon Mr. Shubin does not investigate is how, in our brief tenure on earth, humans have become the most destructive superpredators ever. More on this in a later commentary.