

Reading:

***Natural Theology: or Evidences of the Existence and Attributes of the Deity*
by William Paley (1802)**

“In crossing a heath, suppose I pitched my foot against a stone, and were asked how the stone came to be there, I might possibly answer, that, for anything I knew to the contrary, it had lain there for ever.... But suppose I had found a watch upon the ground, and it should be inquired how the watch happened to be in that place. I should hardly think of the answer which I before given—that, for anything I knew, the watch might have always been there. Yet why should not this answer serve for the watch as well as for the stone? For this reason, and for no other, viz., that, when we come to inspect the watch, we perceive ... that its several parts are framed and put together for a purpose, e.g. that they are so formed and adjusted as to produce motion, and that motion so regulated as to point out the hour of the day.... The inference, we think, is inevitable, that the watch must have had a maker: that there must have existed, at some time, and at some place or other, an artificer or artificers who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use.”

Sermon:

**In Celebration of Charles Darwin
by Robert W. Wallace**

This past week, Thursday, February 12th to be exact, we celebrated the 200th anniversary of the birth of two great men: Abraham Lincoln and Charles Darwin. Both men were born on the exact same day in 1809. Last week the Rev. Sue presented a sermon in remembrance of Lincoln. Today, I would like to remember and celebrate the life and work of Charles Darwin.

This year also marks the 150th anniversary of the publication of Darwin’s seminal text, *The Origin of Species by Natural Selection, or the Preservation of Favored Races in the Struggle for Life*, which contains, according to the American philosopher Daniel Dennett, “the single best idea that anyone has ever had”...”ahead of Newton and Einstein

and everybody else.” Back in 1959 on the 100th anniversary of the publication of the *Origin of Species*, the geneticist H.J. Muller delivered an address entitled “One-Hundred Years Without Darwin are Enough.” The jest of Muller’s talk was that the central message of Darwin’s *Origin* has been missed because it is so radical that we have a difficult time accepting it. I think that if Mueller were here today he would now say that one hundred and fifty years without Darwin are enough.

In the 1820’s Darwin was enrolled at Cambridge University with the aim of becoming a minister in the Anglican church. His father, Robert Warren Darwin, planned to purchase a small country parish for his son. Yes, the purchase of a parish ministerial position by wealthy families was not terribly uncommon in those days. There Charles could have a useful and respectable profession while at the same time pursuing his passion for natural history.

One of the most important texts studied by Darwin at Cambridge was William Paley’s *Natural Theology*, which was the source for this morning’s reading. Paley’s analogy of the watch and a watchmaker was at the time one of the central arguments for the existence of God: If it is obvious that a watch must have had a designer and a creator, that it could not have come together as a fully functioning unit simply by chance, then how much more obvious must it be that the complexity of life must have had a designer and a creator. Paley goes on to proclaim in his text that the attributes of the Deity could be ascertained through a study of nature. That is, the good design of organisms and the perfect harmony of nature, clearly reveals not only the existence, but also the benevolence, omnipotence, and intelligence of that creator.

This argument from design was not original with Paley. It can be traced all the way back to Robert Boyle in 1600’s, and today, the idea has not disappeared from our culture. You may recognize it as essentially the same argument as that put forth by the advocates of intelligent design in their modern-day efforts to usurp the teaching of evolution in our science classrooms. As a young man Darwin fully accepted Paley’s argument and anticipated that his career as an Anglican minister would be informed and supported by his love for natural history.

As it turned out, however, the study of natural history was to be the Trojan horse of Darwin’s agnosticism. Shortly after completing his studies at Cambridge, Darwin

received an invitation passed on through his botany professor, John Stevens Henslow, to participate in a voyage on board the H.M.S. Beagle. The primary mission of the Beagle was to map the coastline of South America and then to continue on a full circumnavigation of the globe, taking soundings at various ports. Darwin was not recruited to be the naturalist on board the Beagle, as is popularly thought. That role, by convention, belonged to the ship's surgeon. Instead, Darwin was invited to be a gentleman's companion to the ship's 27-year old captain, Robert Fitzroy, who, by the conventions of the Victorian era, could have no social interaction with any of the official members of his crew, who were by definition below his social status. This made long voyages at times a lonely venture for sea captains. In fact, the previous captain of the Beagle had suffered a severe bout of depression while at sea and took his life by slitting his throat. Fitzroy feared a similar fate, and rightfully so as it turns out, as he was to suffer the same demise later in life. So, he desired to bring along as an unofficial member of the crew, someone of his same social class to serve primarily as a companion. If that person had an interest in natural history, so much the better. Darwin, well educated, a member the upper class, congenial, possessing a passionate interest in natural history, was a perfect fit for such a position.

The mission of the Beagle was originally planned for 2-3 years, but ended up lasting a full 5 years, and Darwin stayed the whole time, even though his agreement with Fitzroy was that he could leave and return to England at any time during the voyage. This experience turned out to be the formative event of Darwin's life.

Darwin only spent about 13 months on-board ship. During the majority of the five-year voyage he was onshore, exploring the interior of South America, New Zealand, Australia and South Africa. He collected thousands of insects, botanical and zoological specimens, and some spectacular fossilized remains including portions of a skeleton of a giant megatherium, an extinct relative of a ground sloth that when standing on its hind legs would have had a height of over 20 feet. He experienced an earthquake on the west coast of South America and perceived that such events, over a very long period of time, accounted for the elevation of mountain ranges, such as the Andes, from the sea floor, thus providing an explanation for the long puzzling observation of fossilized marine organisms routinely found at the summit of such ranges. The voyage on the Beagle gave

Darwin the basis for an entirely different world-view from what he had as he set out on the voyage. It provided him with sufficient puzzles and questions about nature to occupy a lifetime, and he did.

Just a little over three years after returning from the voyage on the H.M.S. Beagle, Darwin married his first cousin Emma Wedgwood. They settled in Downe, a small village in the Kent countryside, and began a family that was to eventually include the birth of ten children. Charles had received an inheritance from his father, and Emma, a member of the Wedgwood pottery family, brought significant wealth to the marriage. As a result, Charles and Emma lived the life of country gentry. Charles pursued his scientific work for the next forty years, publishing numerous books, rarely making more than a day-trip from his home, spending his time carefully pondering the nature of life and the mechanisms that have led to its diversity.

In 1859, twenty-three years after returning from the voyage of the Beagle, Darwin finally published his *Origin of Species* in which he proposed his great idea of natural selection as the primary mechanism by which new species are formed. The basic concept of Darwin's theory is deceptively simple. "How stupid not to have thought of that oneself" declared the biologist Thomas Henry Huxley upon reading the *Origin* for the first time. On the other hand, the implications of Darwin's theory are amazingly rich and complex, possessing tentacles that permeate almost every arena of our society and culture.

The basic idea is very straightforward. First of all, Darwin recognized that all individuals of a species are not identical, but that they possess variations that have a hereditary component. This seems obvious to us today, just look around the room, no two of us are alike. We are all *Homo sapiens*, but we differ in eye color, height, facial features, and many nuanced details of physical structure that make each of us the individual that we are. This is very obvious to us today, but in Darwin's day a common concept of a species was that it represented the unchanged lineage of an individual creation event by God, just as described in the first chapters of the Book of Genesis. Thus, most biologists concentrated on the similarities of individuals in an attempt to discern the ideal "type" for a particular species, and they tended to place less emphasis on the slight differences that exist between individuals within the same species.

The second major component of his theory is the observation that far more organisms are produced in nature than can survive, and that this overproduction leads to a struggle for existence and selective reproduction. Darwin tells the reader of the *Origin* that he recognized this principle after reading Thomas Malthus' "Essay on Population". Malthus noted that the human population was growing at a much faster rate than the growth of the food supply, and if it were not for war, pestilence and disease keeping the human population in check, there would be constant starvation and a struggle for existence. Darwin recognized that this struggle for existence was exactly what he had observed for all of nature while on his voyage.

Darwin then puts these observations together and states his theory:

"Owing to the struggle for life, any variation, however, slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species, in its infinitely complex relation to other organic beings and to external nature, will tend to the preservation of that individual, and will generally be inherited by its offspring. The offspring, also, will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle by the term of Natural Selection."

Darwin goes on to propose that the principle of natural selection, working on different subsets of a population exposed to different environmental conditions, may, over many generations, result in the emergence of new species. Thus, Darwin recognizes that species are not fixed, unchanging entities from the beginning of creation, and provides what has turned out to be a correct mechanism for the constantly changing diversity of life on earth.

Darwin also described other mechanisms by which evolution works, such as sexual selection, a role for altruism, group selection and even an inkling of what evolutionists now term genetic drift. All of these theories, however, are purely naturalistic and materialistic. According to him, the complexities of living organisms and ecosystems were created not through the direct providence and guidance of a benevolent,

all-powerful, intelligent Deity, but purely as a side consequence of the physical laws of nature acting on the material substrate of our planet. His theory totally undermines the “argument from design” as articulated in the watch metaphor of William Paley.

Understanding Darwin in a non-superficial way is a cold bath to some of our fondest hopes. Instead of our being a special entity created in the image of a loving Deity, we are one of an enormous number of twigs on the great bush of life that has emerged over billions of years through the brutal, unfeeling evolutionary process. This is what we have found difficult to understand and accept, and this is what H. J. Muller was talking about in his 1959 address: “One Hundred Years Without Darwin are Enough”.

At times when teaching Darwin and evolution I’ve had students share with me that the cold bath of Darwin’s reality leaves them with a sense of despair. If Darwin is correct, then what is the purpose and meaning of life. I always find this a hard question to address because I think it’s an ambiguity with which we all struggle. From the perspective of our evolutionary heritage, there is no purpose and meaning built into life. But what I try to do is share my belief that purpose and meaning are not commodities imposed upon us by an outside force or being, but a deeply personal essence that we have to create for ourselves, and that this may be one of the most important efforts with which we engage. Science can provide important knowledge about the reality of how the world works, while other disciplines such as philosophy, theology, and literature can help one find purpose and meaning, but that ultimately we find purpose and meaning in what we do and how we interact with others, rather than in what we believe or know at an intellectual level. In a few minutes, during our devotional, I’ll share with you a poem from Mary Oliver that I believe touches upon this quandary.

Darwin believed that some of the strongest evidence for his view of life comes from the similarities in structure found in diverse forms of life. In the *Origin* he wrote:

“What can be more curious than the hand of a man, formed for grasping, that of a mole for digging, the leg of a horse, the paddle of a porpoise, and the wing of a bat should all be constructed on the same pattern and should include the same bones in the same relative positions.”

What Darwin is illustrating in this quote is a prime example of how nature has utilized bricolage as it has gone about creating new forms of life. Bricolage is a word that I came across for the first time only a few years ago when reading *The Sacred Depths of Nature* by the biologist Ursula Goodenough. It's a French word that refers to the process of taking bits and pieces of whatever is at hand to create something new and novel. A good example would be the quilt we see hanging on the wall behind the piano. I can imagine members of our congregation sitting amidst big piles of scrap material, sorting, selecting, cutting, sewing, and eventually creating this beautiful quilt that celebrates our history and some of the customs and events that we hold dear.

Evolution works in the same way to create new species of life. It never starts over from scratch; instead it makes modifications, tinkers with, and puts together whatever is at hand, to create new life forms. The evidence for this is all around and virtually screams out at us. In Darwin's day biology was only advanced to the point where he could see bricolage at the level of morphology, such as the similar structures of appendages he described in the quote from the *Origin*. In the middle of the last century, electron microscopes were developed powerful enough to peer into the interior of plant and animal cells and what was found was more evidence of bricolage: Plasma membranes, mitochondria, golgi apparatus, cytoskeletal structures, nuclei, and ribosomes all very similar, if not identical, in structure and performing the same function in widely diverse organisms ranging from the one-celled Paramecium to daffodils to man.

Today we can analyze minute differences in the amino acid sequences of proteins and the nucleotide sequences of DNA, which, of course, is the ultimate source of biological variation. What we see again and again is bricolage: the same protein or sequence of DNA used over and over with slight modifications from one organism to another.

I recall vividly when this first struck home to me. I was working as a postdoctoral scientist at St. Jude Children's Research Hospital in Memphis, Tennessee, in the early 1980's. Our laboratory was studying several enzymes that are important for brain function, and I was attempting to isolate in a pure form one of these enzymes. To make a long story short, I was unable to isolate the enzyme. What we could do, however, was isolate a protein from brain that greatly increased the activity of this enzyme. The protein

required calcium to modulate the enzyme activity, and it had been determined that it was a calcium-binding protein, so we named the protein calmodulin. We published our results and other laboratories around the world began working on what appeared to be calmodulin isolated from other tissues and other organisms.

As a graduate student I had studied proteins found in cottonseeds, and I happened to have some cottonseed meal stored away in the freezer. I took it out and found that I could isolate from it a protein that seemed very similar to the calmodulin we normally obtained from cow brain. The real test though was if it had the same activity. So, one day I combined the calmodulin-like protein from cottonseed in a reaction mixture containing the enzyme from cow brain and held my breath as I waited to determine if the plant calmodulin would bind to and activate the brain enzyme. I still recall the sense of awe I felt as I stood in front of the scintillation counter and saw the counts of radioactivity begin to mount, an indication that the brain enzyme had indeed been activated by a plant calmodulin. Not only did it activate the enzyme, it did so just as effectively as the calmodulin from brain. I think this is amazing. Cows and cotton plants branched off from their last common ancestor some 450 million years ago. That common ancestor must have possessed a gene that encoded a calmodulin protein and a version of that gene is still present today in the each of the lineages that branched off of that common ancestor.

Today we know that calmodulin is found in all eukaryotic (nuclei containing) organisms, that over 100 different binding targets for calmodulin have been identified, and that it is one of the principal protein paths by which calcium mediates cellular function. Calmodulin does not elicit the same biological response from all cells. The biological response is dependent upon the particular set of binding targets for calmodulin present in a given cell. All of this is a prime example of bricolage at the molecular level. Once the calmodulin mechanism for calcium regulation emerged, it was used over and over again in different ways and in different cell types, as life evolved.

It turns out that this story is not at all unusual to the modern day molecular biologist. It has been played out over and over again with different genes and proteins, and it all points to the fact that all of life is connected by a common origin at the base of an enormously complex bush of life, just a Charles Darwin proposed. Today, the very

path of evolution is found written in the sequences of DNA, and those sequences are being used to recreate the bush of life about which Darwin could only theorize.

To me, all of this brings special meaning to our UU Principle “to affirm and promote respect for the interdependent web of existence of which we are all a part”. I believe that if Charles Darwin could be with us today he would be in hearty agreement. In that spirit, I would like to close with the much-cited final two paragraphs from Darwin’s *Origin of Species*.

“It is interesting to contemplate an entangled bank, clothed with many plants of many kinds, with birds singing in the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us Thus, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been breathed into a few forms or into one; and whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved.”

Meditation:

You do not have to be good.

You do not have to walk on your knees
for a hundred miles through the desert, repenting.

You only have to let the soft animal of your body
love what it loves.

Tell me about despair, yours, and I will tell you mine.

Meanwhile the world goes on.

Meanwhile the sun and the clear pebbles of the rain
are moving across the landscapes,
Over the prairies and the deep trees,
the mountains and the rivers.

Meanwhile the wild geese, high in the clean blue air
are heading home again.

Whoever you are, no matter how lonely,
the world offers itself to your imagination,
calls to you like the wild geese, harsh and exciting---
over and over announcing your place
in the family of things.

Mary Oliver, 1986

Benediction:

From: *The Sacred Depths of Nature* by Ursula Goodenough

“Blessed be the tie that binds. It anchors us. We are embedded in the great evolutionary story of planet Earth, the spare, elegant process of mutation and selection and bricolage. And this means that we are anything but alone.”

May we go with peace and goodwill in our hearts.