What is “Natural Selection”?

One big question asked by most of us is “Who are we and how did we get here?”. Of course the easy answer is that we were produced by the fusion of a sperm from our father with a mother’s egg and then implanted in our mother’s uterus. We were then maintained for roughly nine months in the warm and cozy woom of our mother and at the end of that time came kicking and screaming (or perhaps gently) into the world. Unfortunately, this explanation does not answer the broader question of how we came into being as the human species. To answer that question we must look into the realm of evolutionary theory.

Various theories of evolution have been proposed since the earliest of times, but it was only in the mid-19th century when the mechanism of evolution by means of natural selection was proposed. It is of interest to know that two folks came up with the idea; Alfred Wallace, a naturalist with experience in South America and in the islands of East Asia and Charles Darwin, a naturalist who had travelled with the *HMS Beagle* that circumnavigated the world in the 1830s. Soon after his return to England he married and then bought a home on the outskirts of London in Down where he and his wife had ten children, three of which died in childhood and where he began work as a practicing naturalist. The general concept used the idea of Thomas Malthus, who said that more progeny are produced than can be sustained by the available food.

Darwin and Wallace came up with the following postulates:

1. More offspring are produced than can be sustained
2. Some traits are adaptive while others are maladaptive
3. Therefore not all will survive and the ones that survive are those having traits that are suitable for the present environment.
4. Those that survive, will then pass on those adaptive traits to their own offspring.
5. Thus through time a population will change to reflect the accumulation of suitable adaptations.

Notice that in natural selection there is no preconceived notion of what might be a suitable adaptation. We do know that all populations of organisms contain genetic diversity and that often that genetic diversity is enhanced by mutations, most of which are ill-adaptive, but some of which have an advantage. So the goal of most organisms is to produce progeny that will carry along their genetic information into the future with the hopes that the genes will code for suitable traits that make success viable.

The above is the simple story of what is meant when we say that organisms evolve by means of natural selection. Our understanding of modern genetics tells us that the real story is far more complex. The old story is “one gene produces one enzyme” is still true, but we know that most traits are controlled by more than one gene and that in many cases the output of one gene may have a direct relationship on the output of a related gene. We also know that the environment can either directly or indirectly control gene expression.

Some Reading Material:

Quammen, David. 2007. *The Reluctant Mr. Darwin: An Intimate Portrait of Charles Darwin and the Making of His Theory of Evolution.* Boston: W.W. Norton and Company. 304 pp.

David Quammen is one of my favorite writers. He used to write for *Outside Magazine* but now is an independent scholar. There have been a multitude of biographies of Darwin, but this is a nice short, readable one. The term 'reluctant' is in the title, as Darwin essentially had come up with his idea of natural selection 21 years before it got published in a short paper in 1858 and in the *Origin of Species* book in 1859. They question of why did he wait so long? He was forced into publishing it because Alfred Wallace had written him a letter detailing the same ideas that Darwin had about species change. Priority being what it is, Darwin had to get into print to have his ideas recognized.

Quammen, David. 2013. *Spillover: Animal Infections and the Next Human Pandemic*. Boston: W. W. Norton and Company. 592 pp.

This book is so germane with what is happening today with respect to the coronavirus. Quammen looks at a wide variety of different diseases and talks to the folks studying them. He asks the same question of all, "When will there be a pandemic of the disease?" The researchers all answer "There will be a pandemic, but we can't predict which disease and when that pandemic will occur." Some now think that the coronavirus will be the pandemic that all have predicted.

Quammen, David. 2019. *The Tangled Tree: A Radical New History of Life.* New York: Simon and Schuster. 480 pp.

As mentioned in the above essay, our present understanding of natural selection and evolution is a lot more complex than what I let on to. Quammen goes into the details in this volume, but at a level that is understandable to anyone with a general knowledge of biology. Again, it is well written with lots of interesting details.