THE FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

Summer, 2017

****

SPECIAL EDITION

****

THE THEORY OF EVOLUTION: One Astronomer's Opinion

By Bill Warren

****

Let's begin by defining the terms in the title.

An *astronomer* is anyone who is interested enough in astronomy to pursue the subject on an ongoing basis without being required to do so. You weren't required to join FRAC, so you're an astronomer.

A *theory* is an idea that attempts to explain something that is presently unknown or unexplained. When a theory is shown to be valid, it becomes a *fact.*

An *opinion* is what one believes to be true, regardless of whether it has any basis in fact. For example, I consider myself to be the spitting image of Brad Pitt, but you and Angelina Jolie may have other opinions. (Mine is correct, though.)

Basically, *evolution* is the theory that, over time, life forms have developed and changed in response to their environment or changes in it. Whether you believe that theory is valid is your own opinion. But evolution is an emotive word; that is, its use tends to stir strong emotions that are based on strongly-held beliefs.

For many people, the word evolution conjures up mental images of monkeys dropping down from trees to become humans. For many others, evolution explains how life processes work. And since extremists on both sides are convinced that they are 100% correct and the other side is 100% wrong, debates about evolution tend to be very heated.

Charles Darwin developed the theory of evolution. Darwin referred to it, not as evolution, but as *natural selection*. (However, he wrote extensively about "the origin of species," which amounts to the same thing as evolution.)

It is not my intent to choose one side or the debate or the other, or to urge you to do so. (I couldn't change your mind if I tried.) And since I don't want readers thinking of monkeys while they're reading this, I'll keep my use of the word evolution to a minimum – at least, in the first half of the report. (Brilliant strategy, Bill: Devote a Special Edition to something without referring to it by name. And when you tell us, *Don't think of a monkey*, what's the first image that pops into our heads?)

At any rate, here's a pretty safe bet: When we're done, we'll have more questions than answers.

Here's another safe bet: As you read this report, some of you will think I'm an atheist because of the questions I raise; others will think I'm not, for the same reason. In fact, I'm not an atheist, but that

doesn't mean I'm not entitled to raise questions on both sides of the issue in order to explain it fully.

* * *

How Theories Arise. We may think we know a lot about the universe, but in fact we know very little about it. Sir Isaac Newton expressed that fact nicely: "I do not know what I may appear to the world, but to myself I seem to have been only like a little boy playing at the seashore, and diverting myself now and then finding a smoother pebble or a prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."

Astronomers don't know as much about the universe as they'd like to, so they develop theories about what it's composed of and how it works. And because those theories are unproven (or else they'd be facts), it's easy to dismiss them by saying, "That's wrong. My theory is better." Scientists have used that approach many times in the past; sometimes they were right, and sometimes they have been proven wrong.

Different Strokes for Different Folks. Before discussing theory, let's start with a fact: *Every living organism on our planet is different, whether broadly or subtly, from every other member of its species.* If it were otherwise, all humans would have the same color hair, all elephants would be the same size and all trees of the same kind would have the same number of limbs. But why do such differences exist?

Put simply, the answer is *heredity.* When plants and animals reproduce, they pass on their genetic traits to their offsprings. (Of course, environment plays an important part, too. Seedlings that take root in infertile soil or in an environment that does not offer adequate sunlight or water are far less likely to grow into towering trees than others that grow in more suitable environments.)

Genetics is a relatively modern science: it originated with the work of Gregor Mendel in studying plants between 1856-1863. Mendel found that he could cross-breed different strains of pea plants and predict the traits of the offspring. But questions about how differences arose among living organisms began much earlier than that.

Pre-Darwinian Theories. The scientific method, which involves forming a hypothesis, testing it and observing the results to determine whether the hypothesis is correct, did not develop until the 17th century. Prior to that time astronomers, who did not have the technological resources that are available to us today, relied primarily on reason and logic to answer scientific questions. That's why ancient astronomers and other scientists were often referred to as philosophers.

Sometime before 430 b.c., the Greek philosopher Empedocles declared that the broad array of plants and animals on Earth is random, and those that survive are the ones that can provide for themselves, reproduce and adapt to changes such as heat and cold.

Later, the Greek philosopher Aristotle (384 b.c.-322 b.c.) argued that the differences Empedocles spoke of were not random, but served a guided purpose. He cited the example of *teeth*, which for many animals improves their chances for survival. Those that don't need teeth to survive don't have them. (Neither did my grandfather: you should have seen him try to eat corn on the cob!)

That's pretty much the way things stood for the next 2,100 years, until Darwin began to explore the question again in greater depth.

Charles Darwin and Natural Selection. Darwin was an English naturalist, geologist and biologist. He is best known for his book *On the Origin of Species,* which was published in 1859. By any measure, it is one of the most influential books ever written: it created a firestorm of controversy that is still going strong more than 150 years after its publication.

Charles Darwin was born in 1809. As a young man of 29, he read and was strongly affected by *An Essay on the Principle of Population,* written by economist Thomas Malthus**.** In that essay Malthus noted that, although human reproduction has no natural limits, there *are* limits to man's ability to produce food. While population increases geometrically -- 1, 2, 4, 8, 16, 32, etc. -- food production increases arithmetically (1, 2, 3, 4, 5, 6, etc.) and is limited by the amount of land that is suitable for farming. If the population rages out of control and food production cannot keep up with it,

Malthus wrote, the result will be a "struggle for survival."

That revolutionary thought, combined with Darwin's observations of wildlife in the Galapagos Islands during a 5-year voyage of the *H. M. S. Beagle* between 1831-1836, led Darwin to formulate his theory of natural selection. Basically, it states that *individuals or species that are best able to adapt to their environment are most likely to survive, reproduce and pass on their adaptive traits to their offsprings.* Those who cannot adapt will reproduce, too, but their offsprings will be no more equipped to survive than they were.

Over time, Darwin wrote, the number of individuals with successful adaptive traits will increase, while the number of individuals who cannot adapt will decrease. The net result will be changes, however profound or minor, that will ensure survival of the species.

Darwin referred to his theory as "natural selection," but after reading *On the Origin of Species* the English philosopher and biologist Herbert Spenser called it "survival of the fittest."

Darwin made a distinction between natural selection and *artificial selection* (e.g., farmers selecting livestock for breeding purposes and gardeners developing new varieties of roses and orchids).

Artificial selection is a fact, not a theory. Keep that in mind next time you see a *liger* – a hybrid cross between a male lion and a female tiger – or when you eat a *tangelo*, which is a citrus hybrid of tangerines and pomelos, or grapefruits.

And that brings up an interesting question: *Humans have successfully cross-bred and cross-pollinated animals and plants to produce new breeds such as* cattalo *(a hybrid of cattle and buffalos); why should it be unreasonable to assume that nature is capable of doing the same thing?*

* * *

There are two sides to every issue – or three, if you consider compromise to be a side. So before addressing objections to the Darwinian theory of natural selection, let's take a look at its merits:

Only the Strong(est) Survive. (I "adapted" that heading from a 1968 song, "Only the Strong Survive," by r&b artist Jerry Butler.) In Michael Crichton's *Jurassic Park,* mathematician Ian Malcolm observed that "Life will find a way (to survive)." And that may be true.

But not all life.

*Sometimes not even the strongest survive. The mighty dinosaurs, masters of all they surveyed, went extinct 60 million years ago (along with practically everything else that was alive at the time) when an asteroid crashed into the Gulf of Mexico and changed the living conditions on Earth. Many eons later, the theory goes, when life re-established itself mastodons, woolly mammoths and saber-tooth tigers were well-equipped to survive in most respects, too – but they could not adapt to things like climate change (the Ice Age) and the hunting techniques of humans. So they went the way of the dodo and the carrier pigeon.

Scientists say that there have been five extinction events since life began on Earth, the dinosaur killer being the latest one. In each case, some life forms survived and gradually replenished the Earth with new life forms such as mammals, which suggests that the Darwinian theory is valid.

*Every individual within a species is unique. You and I have the same number of eyes, ears, limbs and other body parts, but you could easily name a hundred or more ways in which we differ. (For example, you don't look like Brad Pitt.) We are basically the same as Neanderthal Man, too, yet we have survived while N. M. is no more. In Darwinian terms, Neanderthal Man was "selected" for extinction because he did not possess the intelligence to survive, whereas other humans (i.e., homo sapiens, or "thinking man") found ways to adapt successfully – for example, by domesticating animals, learning to farm and developing farming communities that grew into cities for protection and shared labor.

*During the 1800s and continuing into the mid-1900s, it was not uncommon for African elephants to possess tusks weighing 100-200 lbs. per tusk. But because ivory was highly sought after for jewelry and piano keys, big tuskers were slaughtered by the thousands by hunters. The adults that survived were those with small tusks.

International conservation efforts and stricter hunting laws eventually combined to revive

elephant populations, but by then conservationists found that African elephants were no longer producing large tusks. By the mid-1980s, studies showed that the average size of adult elephants' tusks was 35 lbs. per tusk.

It wasn't a matter of elephants thinking, *If I grow small tusks, I may not get shot!* Rather, according to Darwin's theory it was nature selecting which elephants possessed the traits necessary to survive and continue the species.

*In the Jan. 2017 issue of the *Observer,* I told how a coronal mass ejection (CME) burst of solar energy could leave the majority of Earth's population without electricity for as long as ten years. (If you're new to FRAC, you can find the article in the Newsletters section on our website.) In *Astronomy* columnist Bob Berman's words, such an event would literally "knock us back to the Stone Age."

I asked FRAC's Larry Higgins who he thought would be most likely to survive without electricity for such a long time. He said, "The ones who are young enough and strong enough. The ones who can get food for themselves and their families without depending on other people to provide it for them."

Since most of our society and its workings are based on the use of electricity, it's obvious that many (if not most) of us would not survive such a holocaust. In Darwinian terms, those who managed to find a way to survive would pass on their survival traits to their offspring; as for the others – well, you can imagine their fate…

Those arguments appear to be rather convincing evidence that some kind of natural process tends to favor those who are equipped to survive. Humans have survived because – so far, at least – we possess the intelligence to have found ways to adapt to or change our environment.

(The advancement of human civilization has eliminated many species and hastened the demise of many others; we may in fact be digging our own graves by depleting the Earth of natural resources and polluting the skies with chemicals that can destroy Earth's protective ozone layer. But those problems, severe as they may be, are beyond the scope of this report.)

As convincing as those arguments favoring natural selection may appear, they represent only one side of the equation. Not everyone accepts natural selection as a valid theory, of course, or else there would be no debate. Here is the other side. These objections are equally potent.

* * *

Objections to Darwin's Theory. Let's begin with what I consider to be the weakest argument, i.e., objection to the term "survival of the fittest." Such objectors contend that it implies that some people are not fit (i.e., worthy) to live.

First, it should be pointed out that the term originated, not with Charles Darwin but with Herbert Spenser. But Darwin never suggested that anyone is unworthy to live; he merely stated that some people (and animals and plants) are more capable of adapting to their environments than others. But if you object to a phrase, concept or theory, you'll disagree with it no matter how it is stated.

On the other hand, Darwin himself admitted that natural selection may not be all-inclusive: "I am convinced that Natural Selection has been the main but not exclusive means of modification (of species in response to the need for adaptation to their environment." While his statement probably referred to artificial selection, opponents have argued that it could also apply to their view as well.

Elsewhere, Darwin wrote that "If variations do occur, assuredly such individuals will have the best chance of being preserved in the struggle for life. And from the strong principle of inheritance they will tend to produce offspring with similar characteristics."

The key phrase in all that is *If variations do occur*. It underscores the theoretical nature of natural selection, and it leaves the door open to the possibility of other views being valid if variations do *not* in fact occur.

*A second objection is that natural selection is an unnecessarily harsh and negative way of looking at life processes on Earth. But life *is* harsh, and it is often cruel. We may forget this because humans as a species have fought their way to the top of the terrestrial food chain. But all it would take for us to return to survival mode is a massive CME, nuclear

war or the arrival of another big asteroid or comet. We tend to forget that because we live in relative comfort, largely shielded from nature's brutality.

In our society, most of the important work such as growing food and protecting us from things like asteroids, bacterial and viral threats that could wipe us out and the dangers posed to us by others of our species – all of those things are done by other people. And all of us benefit from the fruits of their labors.

*A third objection: *If natural selection is so important, why aren't all living organisms equally equipped to adapt to changes in their environment?*

The simple answer is, Because every individual is unique. Some are born with greater ability to adapt than others.

Another answer: Maybe we *are* adapting, we just don't know it. (See p. 7.)

*A fourth objection is based on the biblical account of Creation. From Genesis 1:27: "God created man in His own image." And later, in Genesis 1:31: "Then God saw everything that He had made, and indeed it was very good." According to the *Bible,* the act of creation spanned a week – not an instant compressed into a single "Big Bang" – after which God "rested on the seventh day." (Genesis 2:2).

(Personally, beyond wondering in passing why an all-powerful Creator would need to rest after His labors I have no problem with those apparently conflicting viewpoints. For me, it's not an either/or proposition here, but of deciding what I can live with. I choose a middle ground: God said "Let there be light!," and presto!: Big Bang!)

Continuing the biblical account, within a few days the newly created Earth was populated by a myriad of creatures, large and small, terrestrial and aquatic. The timeline of their creation is immaterial to me; the important part is accepting or rejecting the idea that a Creator God was responsible for it, no matter how long it took. Assuming (as I do) that the Earth and its habitants were an act of creation, an all-knowing, all-powerful Creator is certainly capable of doing that.

Still… It's one thing to accept that we were made in the image of God. It's something else again to assume that that image includes understanding the mind of God. He could not possibly have revealed the infinite fullness of His mind and works to us, or else the *Bible* would be infinitely long.

There were no automobiles or artificially-produced electricity around when the Earth was created. But they're here now, along with millions of other things like telescopes, computers and Amway products. That fact shows emphatically that the Earth has changed since its creation. Isn't it possible that, unknown to us, God also created the potential for humans to adapt to their environment – and to change it or be changed by it -- and to pass on those survival traits and characteristics to their offsprings?

Like an iceberg, however, this is only the tip of the problem. I saved the most severe objection to natural selection for last.

*Finally, there is the objection that natural selection could not possibly account for the incredible diversity of life on Earth. It's a powerful argument – so powerful, in fact, that I must reintroduce the term <u>evolution</u> in order to analyze it. This argument is precisely what divides the *creationists* and *evolutionists* into two camps.

Creationists accept the biblical account of creation as factual, including Genesis 1:30-31 in which God created the aquatic and terrestrial animals and plants on the 5th and 6th days of Creation.

Evolutionists, on the other hand, believe that life arose from primitive microorganisms – bacteria, protozoans and algae that came into existence in the primeval oceans about 4 billion years ago and developed the ability to grow and reproduce. Over the ensuing billions of years, they gradually became more complex and eventually evolved into an even more complex array of plants and animals. Sometime during that process, some of the plants and animals developed the ability to survive out of water, and they left the oceans to live, grow, reproduce on land –

And climb down from trees to become humans?

Creationists believe the biblical account of creation, which states that God created man in His own image; as a result, they cannot accept the evolutionists' theory that, over millions of years, humans evolved from primitive ape-like creatures. They – the creationists – find it abhorrent to suggest

that the God who created man looks like a monkey, or that man descended from a monkey.

Unless those two viewpoints – creationism and evolution – were formulated at opposite ends of the universe, they could not possibly be farther apart. Here's another, possibly even more compelling reason why that is so:

As noted previously, scientists say that there have been five extinction events in Earth's history. In each case, they say, about 90% of the plants and animals perished when heavy clouds of dust filled the upper atmosphere and prevented sunlight from reaching Earth's surface for many years. Deprived of sunlight, the plants died, thus depriving both herbivores and carnivores of their food sources. The only plants and animals that survived were the 10% that lived underwater or underground.

We know – at least, we think we know – that sunlight is one of the necessities for life to exist on Earth. Sunlight carries energy that plants and animals use to generate their own energy in order to live. But life has been found in places where sunlight never penetrates: at depths of 35,000 ft. in the Marianas Trench, and deep within caves where animals such as blind fish exist without sunlight. So maybe we don't know as much as we think we do.

I mentioned earlier that I have no problem reconciling the biblical and scientific accounts of Earth's creation and the Big Bang. But that's just me; you may have severe problems accepting both as valid. However, those five extinctions up the ante to another level.

Three possibilities exist. Either (a) the extinctions did not occur; (b) they occurred but, unknown to the author of Genesis, God saw fit to replenish the Earth with new forms of life without telling us; or (c) on each occasion life started over virtually from scratch and evolved into new forms.

Which of those possibilities do you believe?

Much Ado About Nothing. To me, the science vs. religion debate is like grocery shopping. You walk down the aisles, examining products on both sides and selecting the ones you want or need. But it's also like people at the beach wearing scanty bikinis or thongs: There's more to them than meets the eye.

To say that creationists and evolutionists don't always see eye-to-eye is a massive understatement. There are, however, two points on which they agree: Humanity had a beginning, and it will also end. We live somewhere between those events, so it is natural that we should wonder about our origins and future. It is also natural that we should seek answers in different ways and arrive at different conclusions.

Personally, I've never believed that either religion or science has all the answers. If that were so, there would be only one religion, not five major ones – Christianity, Judaism, Islam, Buddhism and Hinduism -- and hundreds of minor ones. And if science has the answers, why are there so many theories and unanswered questions?

I prefer to think that both science and religion offer paths to uncovering truths that can enlighten us, inspire us and give meaning to the universe and ourselves within it. In either/or terms, I stand firmly on both sides of the issue.

For example, I have no problem in accepting evolution or natural selection as a valid explanation of how life changes or has changed since it began on Earth. But I object strongly to Stephen Hawking's famous "God is not necessary" theory. He's necessary in my scheme of how the universe works, and that's what matters to me. Hawking is attempting to eliminate one side from the debate – and from where I sit that's both unethical and impossible. Neither he nor anyone else will ever prove that God does or does not exist. Beliefs are not facts; they cannot be proven.

I object, too, to the reasoning of an enlightened visionary – I forget who it was – who a number of years ago predicted where human evolution is headed, and what humans will look like in the distant future. We will have, he said:

*Extremely wide bottoms (like the *Star Wars* character Jabba the Hut) in order to accommodate sitting all the time;

*Short legs (or none at all, and for the same reason): we won't need legs because mechanical devices will do everything for us and take us wherever we need to go;

*Huge heads (again, like Jabba the Hut) to accommodate larger brains; and finally,

*Hands with one or two fingers (for grasping hand-held electronic devices and punching computer keys). As evidence that his prediction

was accurate, he pointed out that our little fingers are already evolving out of existence.

Ridiculous as the author's evolutionary vision appeared to me, I have included it here to show the problem associated with extremist views. They weaken the more reasoned arguments that exist on either side of the issue by implying that there is no middle ground for compromise. I simply refuse to believe that.

I've heard atheists refer to God as "the chance factor" -- a cosmic roll of the dice that produced life on Earth by chance. And I've heard persons of religion refer to deceased atheists as being "all dressed up with no place to go." In both cases I've thought: *Is that the best you can do?*

Belittling one's opponent or his beliefs is a staple of politics – but it doesn't address the important questions. It drives a wedge between opposing views that creates ill will and renders calm, reasoned discussion impossible.

Most of the astronomers I've known are more tolerant of conflicting beliefs than that.

As for the question posed in the prior section regarding which of the three explanations for Earth's five extinctions is most likely to be correct – my response is, *Who cares?* I certainly don't. My faith in both science and religion is broad enough to accept what I consider to be the best of both worlds without confining myself to one or the other. I'll leave the process of crossing the t's, dotting the i's and other fine tuning of the quest for truth to other people who feel compelled to do so. I prefer to spend my time pondering a far more important question: *Why on earth would you think that I don't look like Brad Pitt?*

* * *

The Scopes Monkey Trial

(Consider this an early p.s. to the report.)

Officially, it was *The State of Tennessee vs. John Thomas Scopes,* but no one called it that after the trial began. It quickly became known as "The Scopes Monkey Trial," and for eight days in 1925 it focused the nation's attention on the theory of evolution and whether it should be taught in public schools.

The trial, which was held in Dayton, Tenn. in July, 1925, began as a publicity stunt intended to draw visitors to the area. But it quickly grew into much more than that, pitting two well-known lawyers, William Jennings Bryan (a 3-time presidential candidate and ex-secretary of state) as prosecutor against Clarence Darrow, an equally famous defense attorney.

The trial lasted eight days and brought an ocean of national publicity to Dayton: more than 200 reporters from all parts of the U. S. covered the trial for newspapers and broadcasted live radio reports of the proceedings.

Initially, the case involved the question of whether a 24-year-old substitute science teacher, John Scopes, had violated Tenn. laws by teaching the theory of evolution in public schools. However, early in the trial Darrow shifted the focus to whether the law itself was unconstitutional, by insisting that it violated Scopes's individual rights and academic freedom. Darrow also contended that the law was unconstitutional because it was intended to promote the beliefs of certain religious groups.

Throughout the brief trial, defense attorney Darrow repeatedly outmaneuvered prosecutor Bryan, who had not participated in a court case in 36 years. When the judge denied Darrow's request to put eight expert witnesses on the stand to testify on behalf of the Bible, he took the unprecedented step of calling Bryan himself as a witness, referring to him as a "Bible expert." Darrow's intention was to show that teaching a strictly creationist view in a biology class (which Tenn. laws required) was unscientific.

With Bryan on the witness stand, Darrow proceeded to ask questions such as "If Eve was actually created from Adam's rib, where did Cain get his wife?" and "Tell us about the temptation of Eve by the serpent." When Bryan, who was by no means a biblical scholar, was unable to successfully answer Darrow's questions, Darrow scoffed that "Stories from the Bible are not scientific; they should not be used in teaching science. You insult every man of science and learning in the world who does not believe in your religion!" Bryan's response: "Your purpose in asking such questions is to cast ridicule on everybody who believes in the Bible!," whereupon Darrow replied, "My purpose is preventing bigots and ignoramuses from controlling

education in the U. S.!" Such heated exchanges characterized most of the proceedings throughout the trial. They were generally initiated by Darrow, who showed absolutely no respect for Bryan.

It took just nine minutes for the jury to reach its verdict: Scopes was found guilty of violating Tenn. laws and ordered to pay a $100 fine. (The verdict was later reversed on appeal, due to a technicality.)

So Bryan won the case. (He died five days after the trial.) But in the long run, Darrow and the evolutionists – that sounds like it should have been the name of a '70s rock group -- were the winners. In 1967, the state of Tenn. repealed the law banning the teaching of evolution in its public schools. And today, evolution is taught everywhere in the U. S., with creationists fighting to have creationism taught on an equal footing with evolution in our schools.

(The Scopes Monkey Trial was the subject (in fictionalized form) of a 1960 movie, *Inherit the Wind*, starring Spencer Tracy as the defense lawyer and Fredric March as the prosecutor.)

* * *

Conclusion. So here we are, back where we began. As I said earlier, it's not my task to tell you what to believe. You began reading this with an opinion already formed, and it's unlikely that anything I've written has changed it. (At least, I hope not.) And that's good, too. As Mark Twain observed, "It were not best that we should all think alike: it is difference of opinion that makes horse races."

Whatever the case, I hope that nothing I have written here that you might have disagreed with has offended you or changed your opinion of me. Evolution is a controversial topic, and in tackling it I felt it necessary to present both sides of the issue as fully and impartially as possible.

##