

THE FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT
RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

February, 2018

SPECIAL REPORT:

THE MULTIVERSE

by **Bill Warren**

***Introduction.** In Jan., 2016, I wrote a Special Edition of the Observer, “The Search for E. T.”, in which I examined the question of whether life exists elsewhere in the universe. This report deals with a much broader topic: the multiverse. (Multiverse is short for “multiple universes” or “a multitude of universes.”) As with my E. T. report, I won’t try to convince you that the multiverse does or does not exist; rather, I’ll simply give you the facts as I understand them, and you can decide for yourself.*

-Bill

Once upon a time, humans thought the universe consisted of what they could see around them – land, water and sky. Later, they learned that Earth is part of a planetary system – and later still, that the solar system is a tiny part of a galaxy called the Milky Way. Then came the revelation that our galaxy is but one of many galaxies in the universe. Case closed, right?

Not by a long shot.

If it’s possible, it’s bound to happen
somewhere and sometime.

-old quantum physics saying

The Multiverse

Shortly after humans developed languages, they began to ponder the questions, *Why are we here?* and *How did life arise on Earth?* The answers they found sharply divided *homo sapiens* (“thinking man”) into two groups: those who believed that Earth and its life forms were the handiwork of an all-powerful, unseen Creator; and those who believed that the answers lay elsewhere. Thus began history’s longest-running and most hotly debated topic, i.e., the opposing views of religion and science. Even today, thousands of years later, those questions are still hotly debated.

In recent years, new and infinitely more challenging questions have arisen. At first glance, they may appear to have little or nothing in common with those earlier questions about the origin of life on Earth. But as you’ll see, they are rooted in the same questions that sparked the original science vs. religion debate. Those new questions are:

Is our universe the only one, or are there others? And if other universes exist, where are they and what are they like?

No one knows the answers to those questions, of course. We refer to the portion of the universe that we can see as “the observable universe.” But no matter how advanced our civilization and its technology becomes, we will never see our entire universe, which is still expanding at a fantastic rate. How, then, will we see what, if anything, lies beyond it?

The universe around us is so large that, from our perspective, we are like a subatomic particle on an elephant's back. Wondering whether ours is the only universe or just one of a multiverse of universes is like that particle wondering if the elephant it is riding is the only one or part of a herd of pachyderms. We are limited by what we can see (which isn't much) – but not by what we can imagine.

Still...

Just because astronomers have devised theories concerning other universes and what they may be like doesn't mean that the multiverse does or does not exist. It just means that we don't know what, if anything, is out there beyond our own universe.

Intelligent Design. This term refers to the belief that the conditions necessary for the universe (and life within it) to arise are so complex, precise and finely tuned within extremely narrow limits that nothing short of an all-powerful Creator could produce them. For example, consider gravity.

If gravity had been much stronger than it is, the universe would not have formed. With stronger gravity, the infant universe would have stopped expanding and collapsed shortly after its expansion began. But if gravity had been weaker, it would not have been strong enough to gather material together to form stars and galaxies.

The same holds true of other basic forces of nature: the fine-tuning necessary to hold atoms together, or to produce life as we know it, are so specific that they could not have occurred accidentally.

Or could they?

Randomness, the Chance Factor and A Thousand Monkeys. Advocates of multiverse theory believe that our universe is but one of a possibly infinite number of universes that arose (or are arising) spontaneously and randomly, and not as the result of an act of divine creation. Individually, such universes are referred to as *alternate universes* or *parallel universes*.

Perhaps you've heard this before: *If a thousand monkeys were to type on a thousand typewriters for all eternity, eventually one of them would type the complete works of Shakespeare.* Under multiverse theory, if an infinite number of alternate universes exist, at least one and possibly others as well will

randomly develop just like ours, and in such a way as to produce life without divine intervention. In mathematics, this is known as probability, or the *chance factor*.

Here's the multiverse rationale in a nutshell: *If there are an infinite number of universes, there are also an infinite number of chances of life arising through natural processes, spontaneously and randomly, in more than one of them.*

Objections to Multiverse Theory. As you'll see, multiverse theory is complex. But the objections to it are surprisingly simple and compelling:

1. There is not a single shred of scientific evidence to suggest that anything exists beyond our universe, or that any other universe has interacted (or is interacting) with ours. The multiverse concept is 100% theory, and the support it has received is based on other theories, not scientific facts. With no scientific basis for assuming the existence of other universes, why should anyone suppose that they exist except in the fertile imaginations of science-fiction writers? And where is support for the multiverse theory coming from?

Those questions, at least, are easy to answer: They come from scientists who are searching for a scientific explanation for the universe's origin other than the work of an all-powerful Creator. Theorizing the existence of other universes helps cosmologists to explain in strictly scientific terms the many things that they do not understand about our universe, including how life arose on Earth.

2. The *scientific method* is the backbone of all scientific research. It involves forming hypotheses about unknowns and devising tests to verify the accuracy of those hypotheses. What test could possibly support the multiverse theory, which basically is as unprovable as the existence of God?

Well...Here's one: In 2010, astronomers studying data collected by the Wilkinson Microwave Anisotropy Probe (WMAP) spacecraft claimed to have found evidence suggesting that our universe collided with other parallel universes in the distant past. However, subsequent re-analysis of that data, combined with newer data from the Planck satellite (which has resolution three times as powerful as WMAP had) did not reveal evidence of such a collision, nor was there any evidence of

gravitational attraction between our universe and any other that might exist.

Some cosmologists regard multiverse research as necessary because some versions suggest how and why the Big Bang might have occurred. But such thinking is decidedly unscientific because the theory is so broad and all-inclusive that it cannot possibly be proven false.

Scientific experiments do not uncover ultimate truths; rather, they indicate that a particular hypothesis was or was not found to be false. The more often hypotheses are not found to be false, the closer to the truth they move. But the farther scientists get from what they can see and measure, the more they have to rely on faith that their theories are not false simply because they cannot be disproven. In that sense, when it comes to proving the existence of the multiverse or God, science and religion are strikingly similar. Both require, in the words of the Danish theologian/philosopher Soren Kierkegaard, a “leap of faith.”

3. Finally, you have to wonder: Even if the multiverse exists, where did it come from? What caused those supposed universes to arise out of nothing in the first place?

It’s one thing for multiverse theorists to say that our universe and others arose through Big Bangs; it’s something else entirely to say that the past is infinite, time itself had no beginning and the multiverse has always existed. Everything that exists – space, time, matter, energy and the laws governing the ways they interact, whether in our universe or any other – had to have had a beginning sometime and somewhere. And something had to jump-start the process.

(To counter that argument, some multiverse theorists have cited the quantum physics theory that, at the most basic level inside subatomic particles, time does not exist. Using that theory as a starting point, they have suggested that an infinite number of parallel universes may reside in the landscapes of those timeless portions of particles.)

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In Pursuit of the Multiverse

Origins of Multiverse Theory. Oddly enough, multiverse theory has its roots in *religion*, not science. For example, the ancient Hindus saw our

world (i.e., our universe) as one of an infinite number of worlds, each governed by its own gods who worked out their own cycles of creation and destruction. And in the Christian view, *heaven* could be thought of as another plane of existence after death.

The term multiverse was coined by the American psychologist William James in 1895, although his meaning was not what it is today. He wrote, “Visible nature is all plasticity and indifference, a multiverse ...not a universe.”

Multiverse theory began when, in 1952, the Austrian physicist Edwin Schrodinger happened to wonder if there might be a way that his cat could be alive and dead at the same time. That led him and other physicists to wonder if there are other dimensions in space or time that contain other universes that are like and unlike ours. If so, then it is indeed possible that Schrodinger’s cat could have been alive in one universe and dead in another.

The rest, as they say, is history – or *fantasy*, if you prefer.

Some of the world’s leading astrophysicists and cosmologists (including **Stephen Hawking** and **Neil deGrasse Tyson**, among others) regard the multiverse as fertile ground for study and research. Others are either highly skeptical, or else they consider it a complete waste of time because, even if other universes exist, we would never be able to contact them. Trouble is, the evidence necessary to validate the various multiverse theories is also theoretical.

The Paradox to End All Paradoxes. In order to study the unknown multiverse, it is necessary to understand the workings and design of the largest thing that we know exists – our own universe. But in order to understand our universe, we also need to understand the smallest things in it – the fundamental building blocks upon which matter, gravity and other forces are based. And presently the smallest of those particles exist only in theory.

For a long time, atoms were thought to be the basic building blocks of the universe. But atoms were found to be composed of even more elementary particles such as protons, electrons and neutrons. (Gravity is thought to be composed of theoretical particles called *gravitons*; light particles are called *photons*.) Those subatomic particles and

others are thought to be composed of yet smaller theoretical particles called *quarks*, which in turn are thought to be composed of even smaller particles called *strings*. Since nothing is thought to be smaller than strings, the whole shebang is referred to as “string theory.”

There are many versions of string theory; all of them are far too complex to explain here even if I were capable of doing so. Suffice it to say that they provide a framework for exploring multiverse theory, and they may offer hints as to how the Big Bang might have occurred.

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Imagining What a Multiverse Might Be Like

We live in a four-dimensional universe. Three of those dimensions – *length*, *width* and *height* (or *depth*) – are spatial; the other is temporal, *time* having been added to the dimensional mix by Albert Einstein when he showed the world that time and space are part of the same thing, i.e., *space-time*. (As the old song put it, *You can't have one without the other.*) But what if that there are other dimensions that we are not aware of?

Science fiction writer Douglas Adams (*A Hitchhiker's Guide to the Galaxy*) dazzled his readers with the idea that, even as you're reading this, someone from another dimension of time may be occupying the same space you're using. If that's the case, parallel universes don't have to lie beyond the boundaries of our universe. There may in fact be one large depository of space containing an infinitely large number of universes, all of which occupy the same space in different forms and dimensions that we cannot detect because they reside in other levels of reality that we are unaware of.

At any rate, according to string theory there are six or seven dimensions beyond our four-dimensional universe, making ten or eleven in all.

Bubble Universes. Perhaps the most familiar multiverse theory was devised by MIT cosmologist **Max Tegmark**. Based on string theory, it envisions the multiverse as “a single space containing universe-sized regions in various dimensions of space,” somewhat like bubbles in boiling water. Each bubble is an expanding universe that may or may not be like ours physically, but it is governed

by the same laws of physics. As the bubbles (universes) expand and collide, they produce new, smaller bubbles that experience their own Big Bangs.

Other Multiverse Theories. The example cited above is Level 2 of Tegmark's four proposed levels of parallel universe theory. Each succeeding level incorporates the previous levels and adds other factors. His other levels include:

***Level 1: An Extension of Our Universe.** Basically, this theory suggests that there are an infinite number of universes in “a single space so large that it contains many universe-sized regions” that follow the same physical laws and conditions as ours. According to the laws of probability, at least one of them contains another copy of Earth somewhere.

***Level 3: Many-Worlds.** In this scenario, the multiverse contains other universes that are both like and unlike ours, including universes in which all possibilities that can exist, *do* exist. This refers, not just to life arising in other universes, or that such life forms may be intelligent: it also includes the possibility that on some worlds there are copies of you reading this report right now, and other universes in which copies of you are doing something else.

***Level 4: The Ultimate Ensemble.** This theory envisions (among other things) parallel universes whose fundamental laws of physics are so different from ours that they collapse or expand so quickly that life never develops. But it also includes every other mathematical possibility, including universes that do not contain any matter, and others that are composed entirely of kinds of matter, energy, life forms and physical laws that do not exist in our universe.

Other multiverse theories have been formulated by the American string theorist **Brian Greene** of Columbia University. Three of them are:

***A Cyclic Multiverse** in which universes in different dimensions collide, causing Big Bangs, after which they bounce back and pass through time, not space. Then they re-form and collide again in endless cycles. Like Tegmark's many-worlds theory, this theory hints at time travel, since the old contents are continually destroyed and re-

created into roughly what they were in the previous cycle.

*Greene also envisioned a **Holographic Multiverse** in which “every three-dimensional object we know and cherish is a projection of tiny, subatomic bytes of information stored in a two-dimensional ‘Flatland.’” (Translation: Our entire universe is a gigantic holograph among others that represent different forms of reality.)

*In Greene’s **Quilted Multiverse**, every possible event will occur an infinite number of times in a series of layered universes that we cannot see because of the speed of light.

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Conclusion

There are numerous other variations of multiverse theory, including one in which the observable portion of our universe is inside a black hole that exists along with other universes in a single, all-encompassing universe. Other multiverse theories are so complex that they can be imagined only as mathematical structures or simulated computer models. Virtually all of them – and the ones I’ve described as well – envision an infinite number of universes existing in different dimensions of infinite space. Under those conditions, anything can and will happen, including the development of worlds exactly like ours.

Brian Greene explains, “If you shuffle a deck of playing cards, there’s just so many ways the cards can fall. If you shuffle that deck enough times, the orders will have to repeat exactly sooner or later. Similarly, with an infinite universe that is composed of finite forms of matter, the way in which matter arranges itself eventually has to repeat.” (That’s why string theory is a necessary component of multiverse theory: it studies the smallest forms that matter can be composed of.)

Does that make sense? Consider the Bill Murray film *Groundhog Day* in which Bill’s character, Phil Connors, suddenly finds himself trapped in Punxsatawney, Pa., in an endless succession of Groundhog Days. Every morning, he wakes up to experience a new version of yesterday. Every day in Phil’s life is Feb. 2nd.

In one memorable scene after Phil eventually realizes that, no matter what he does today, he will be the same tomorrow as he was yesterday, he

drives his car off a cliff a la *Thelma and Louise*. (In multiverse terms, Phil is literally experiencing déjà vu because he is bouncing around between other worlds that are exactly like Earth in alternate universes, with the single exception being *him* in that particular time and place.)

As you might expect, the next morning Phil awakens to find himself back in Punxsatawney on Feb. 2nd. (Yesterday’s version of Groundhog Day must have been very painful for him.)

If that sounds far-fetched – well, it *is*. But everything about multiverse theory is fantastic, and it will continue to be little more than science-fiction until someone produces solid evidence that the multiverse is more than just a theory.

And if, like many cosmologists, you cannot accept the idea that ours is not the only universe -- well, consider the principle called “Occam’s Razor”: *The simplest solution to a problem is likely to be the correct one.*

Regarding the multiverse, the simplest solution is that it probably does not exist.

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