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VOLUME TWO

Y-ORIGINS

ARTICLE 2:

What Are the ODDS?

IT'S BECOMING CLEAR THAT THE EARTH IS JUST RIGHT FOR LIFE TO EXIST–AND EVERYWHERE ELSE IS ALL WRONG

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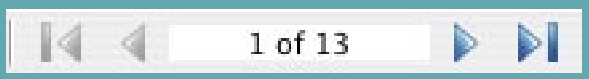

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Chief Editor: Larry Chapman
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Design: Hydragraphik ® Studio (www.hydragraphik.com)
Sun Mountain Productions
Article Editors: Rick James, Eric Stanford
Copy Editor: Eric Stanford
Writers: Larry Chapman, Rick James, Eric Stanford

Y-ZINE
PO Box 6017
Great Falls, MT 59405

ISBN 0-9717422-3-5

What Are the Odds?

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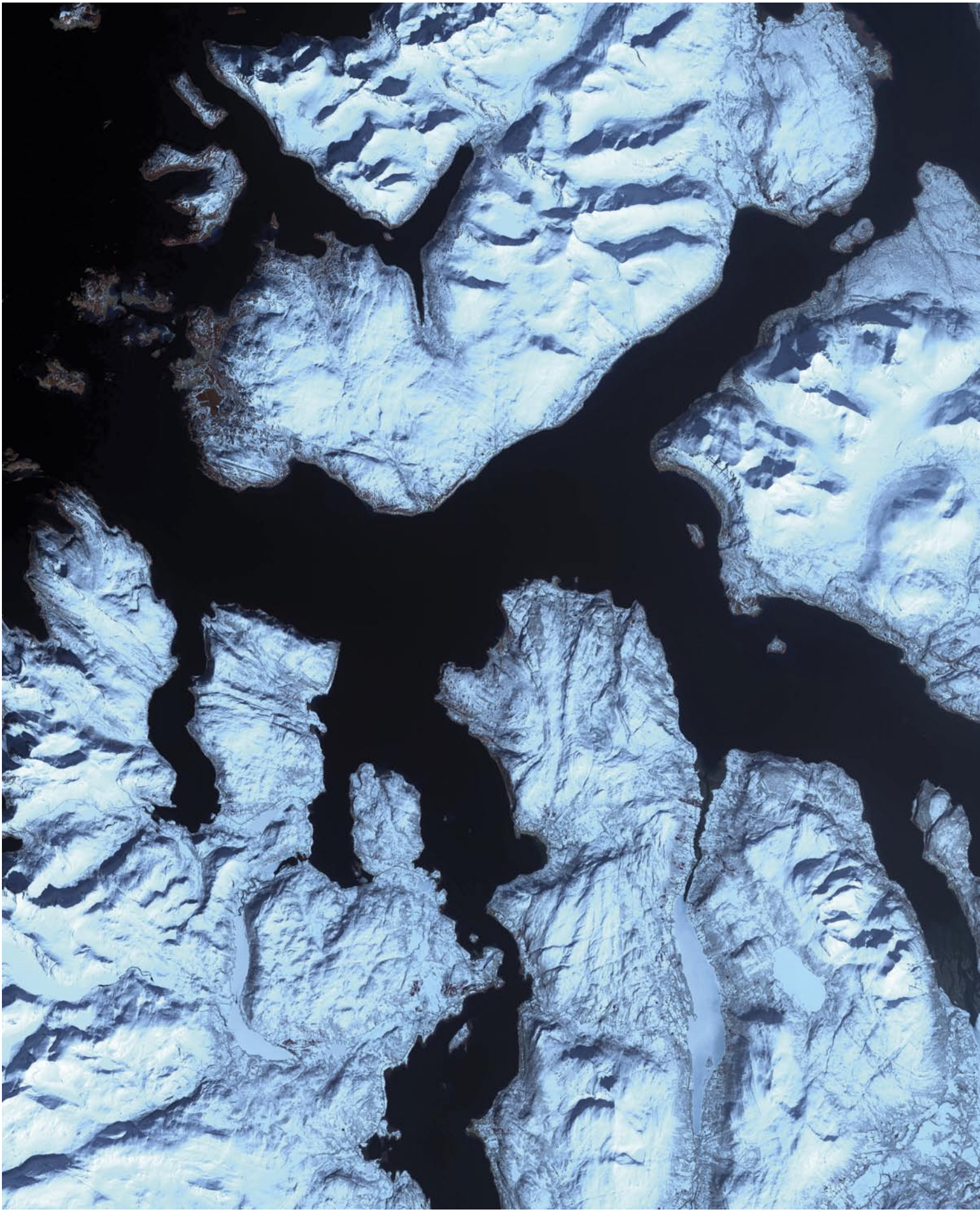
ACKNOWLEDGMENTS

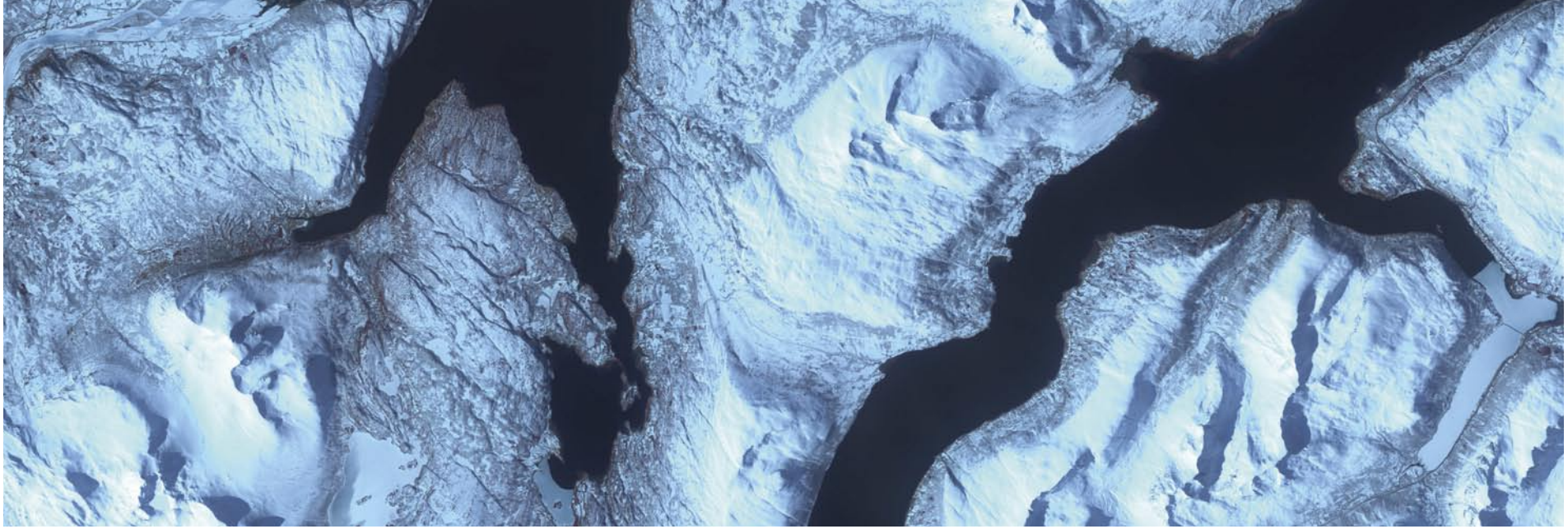
I am indebted to Dr. Bill Bright, who passed away before this project was finished. Dr. Bright enthusiastically endorsed and contributed to the development of the material presented in this endeavor.

Special thanks are also due to Rick James and Eric Stanford, who have both spent countless hours clarifying some of the concepts presented.

Several others have contributed greatly to the writing of these articles, including Dr. Henry Brandt, Dave Chapman, Dr. Bert Harned, and New Testament scholar, Dr. Ron Heine. The valuable input from Brian Ricci, 'Jamin Latvala, and the Campus Crusade staff at the University of Washington were especially helpful and constructive. Special thanks also are due Helmut Teichert of Bright Media, who has been the overall director of the project. Finally I would like to thank my wife, Marianne, for inspiring me to undertake this effort.

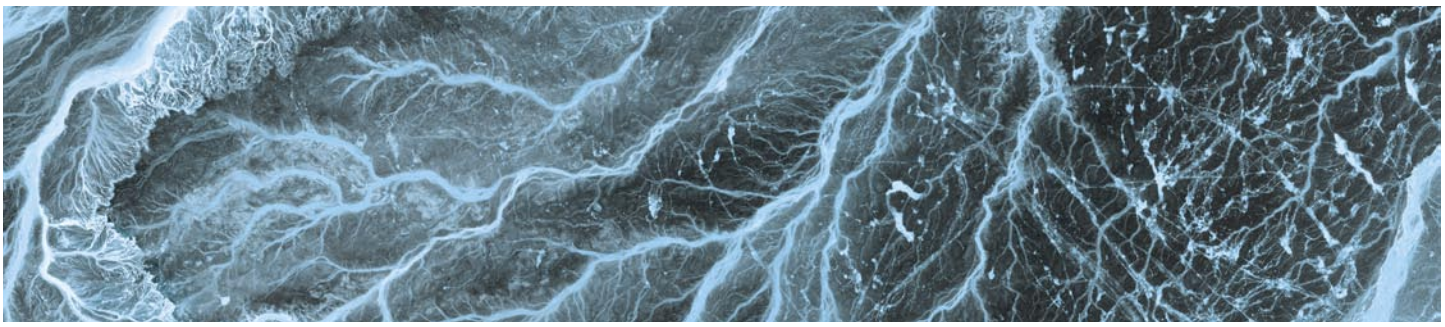
Larry Chapman





WHAT ARE THE ODDS?

life in our universe is so improbable that it defies a natural explanation.



In his movie *Signs*, M. Night Shyamalan presents us with a priest (played by Mel Gibson) who has lost his faith. Through the death of his wife, the priest has come to the conclusion that life is random. He has decided that he will no longer pretend to see God in the picture.

As Shyamalan zooms in his lens, he shows us that life is without focus: there is no recognizable pattern. But typical of Shyamalan, he turns the lens one more screw to the right, and at this magnification a pattern emerges. Gibson's character is able to see the hand of a great designer lurking behind all that had seemed random. His wife's dying words, his daughter's obsession with water, his son's asthma—everything served a larger purpose.

At the end Mel Gibson returns to the priesthood and makes a blockbuster called *The Passion of the Christ*. Well, not exactly, but his character comes full circle—from faith to skepticism and back to faith. Meanwhile, Shyamalan takes his audience on the same circuitous journey, exploring issues of design and higher purpose in the world.

In many ways the evidence for intelligent design of the universe has come full circle. When early humans looked at the heavens, they could not escape the concept of a creator. In fact, until the 1500s, most people believed in the ancient astronomer Ptolemy's teaching, that Earth was the center of the universe.

But, in the 16th century, Copernicus showed that Earth revolved around the Sun. Suddenly our planet seemed less special. Some astronomers looked out at the universe through telescopes and deduced a creator was unnecessary. Their argument for a materialist worldview was energized by the belief in an ordinary Earth.

Although the founders of modern astronomy strongly believed that the universe was the work of a cosmic genius, these later followers saw the cosmos as totally autonomous and independent of a designer. Copernicus, a strong believer in God, couldn't have disagreed more with such an assumption, and would have taken exception to it.

In the 19th century, this belief in an ordinary Earth became popularized as the "Copernican Principle." This principle has become the bedrock for a materialistic view of the world. However,in the latter part of the 20th century evidence began pouring in about the remarkable fitness of Earth for life.

Scientists have learned that only an exceptionally fine-tuned planet like Earth has the necessary ingredients to harbor life. Additionally, our solar system and galaxy, as well as our entire universe, appear designed to support intelligent life.

The odds that such fine-tuning could have occurred by chance is not just unlikely–scientists say it is virtually impossible.

THEY DON'T CALL THESE NUMBERS ASTRONOMICAL FOR NOTHING

An article in *U.S. News & World Report* remarks, "So far no theory is even close to explaining why physical laws exist, much less why they take the form they do. Standard big bang theory, for example, essentially explains the propitious universe in this way: 'Well, we got lucky.' "[1]

On Christmas Day in 2002, Jack Whitaker, of Scott Depot, West Virginia, got lucky, becoming the largest single-ticket lottery jackpot winner until that time in North America. His prize? A Powerball jackpot of $314.9 million. Over a hundred million other tickets didn't match. What are the odds of that? (And what are the odds that within two years he would be robbed twice, face charges for attacking a bar manager,

be sued for making trouble at a nightclub and a racetrack, and be arrested twice for drunk driving? Not nearly as unlikely as his Powerball winning ticket, but still true.)

If someone won even two such lotteries consecutively, we would all assume the results were rigged. And yet, when it comes to life existing in our universe, the odds are far more remote than winning a hundred Powerball lotteries consecutively.

Physicist Paul Davies comments, "The conclusion must be that we live in a world of astronomical unlikelihood."[2]

Donald Page of Princeton's Institute for Advanced Study has calculated that the odds against our universe randomly taking a form suitable for life is one out of 10^{124}, a number beyond imagination.[3]

To try and visualize the difficulty, imagine all the grains of sand on all the beaches on Earth. Then encrypt one grain with a special code known only to you, and randomly bury that grain on a beach somewhere on Earth. (Maybe enjoy a vacation in Maui while you're at it).

The chance a blindfolded person would ever discover that one grain of sand on their first pick is one out of 10^{20} (one chance in 100 billion billion.)

Now offer a reward to anyone who can find it on one pick, even though they don't know which beach to scour, or how deep it is buried. But what if they did? Would anyone believe they discovered it by accident? Yet, scientists tell us that the likelihood of a big bang explosion resulting in a universe able to support life like ours is many times more improbable.

As we consider the odds for the fine-tuning of our universe, galaxy, solar system, and planet, let's keep in mind just how extreme these odds really are. Not just one, but all of them require unbelievably precise fine-tuning. Can such precision be a result of anything other than design? Let's take a look at why many scientists are asking this question.

A FINELY TUNED UNIVERSE

Dr. Robin Collins states in *The Case for a Creator*, "Over the past thirty years or so, scientists have discovered that just about everything about the basic structure of the universe is balanced on a razor's edge."[4] Over 35 different characteristics of the universe and its physical laws must be precisely fine-tuned for physical life to be possible.[5] Following are six of those characteristics:

- 1. *A large enough expansion rate*. The birth of the universe had to begin with enough force, or life couldn't exist. Stephen Hawking states, "If the rate of expansion one second after the big bang had been smaller by even one part in a hundred thousand million million, the universe would have recollapsed before it ever reached its present size."[6]

- 2. *A controlled expansion rate*. Although the expansion rate had to be great enough for the universe to avoid a big crunch, if its outward force had been even a fraction greater, that would have been too much for gravity to form stars and planets. Life could never have been possible.[7]

- 3. *Force of gravity*. If the gravitational force were altered by 0.000000000000000000000000000000000000000000000001 percent, neither Earth nor our Sun would exist—and you would not be here reading this.[8]

- 4. *The balance of matter and antimatter*. In the formation of the universe, the balance between matter and antimatter, and the excess of matter over antimatter, needed to be accurate to one part in ten billion for the universe to arise.

- 5. *The mass density of the universe*. For physical life to exist, the mass density of the universe must be fine-tuned to better than one part in a trillion trillion trillion trillion (10^{60}).[9] Thus, the mass contained in all dark and visible matter, including stars, is essential for the existence of our universe.

"SO FAR NO THEORY IS EVEN CLOSE TO EXPLAINING WHY PHYSICAL LAWS EXIST, MUCH LESS WHY THEY TAKE THE FORM THEY DO. STANDARD BIG BANG THEORY, FOR EXAMPLE, ESSENTIALLY EXPLAINS THE PROPITIOUS UNIVERSE IN THIS WAY: 'WELL, WE GOT LUCKY.'" —U.S. NEWS & WORLD REPORT

- 6. *Space-energy density*. The space-energy density of the universe requires much greater precision than the mass density. For physical life to be possible, it must be fine-tuned to one part in 10^{120}.[10]

According to the big bang theory, all of this minute fine-tuning was programmed into the initial conditions of the first microsecond of the explosion that began our universe. At that instant the rate and ratios of expansion, mass, density, antimatter, matter, etc., were set in place, eventually leading to a habitable planet called Earth.

In addition to the 35 different characteristics of our universe that must be just right for life to exist, our galaxy, solar system, and planet also needed to be exceptionally fine-tuned or we would not be here.[11]

A FINELY TUNED GALAXY

Galaxies are formations of from millions to perhaps a trillion stars. Our own galaxy is called the Milky Way. It's unknown how many galaxies the universe contains, but it may be around a trillion. Surprisingly, given the great number of these star groups, most galaxies are incompatible with life.

In order for life to exist in a galaxy, it needs to meet several criteria.[12] The following are just three of the fine-tuned characteristics a galaxy needs to support life:

- *Shape of the galaxy*. The Milky Way is spiral-shaped. Of the three types of galaxies—elliptical, irregular, and spiral— the spiral type is most capable of hosting human life.
- *Not too large a galaxy*. Our Milky Way is enormous, measuring 100,000 light-years from end to end. However, if it were just a bit larger, too much radiation and too many gravitational disturbances would prohibit life like ours.
- *Not too small a galaxy*. On the other hand, a stable Earth orbit that is necessary for life could not exist if our galaxy were slightly smaller. And a smaller galaxy would result in inadequate heavy elements, such as iron and carbon, essential to life.

Our Milky Way galaxy meets these and many other conditions essential for life. Most of the others do not.

When we focus in even closer, on our own star and its planets, the odds for life being possible become even more extreme.

A FINELY TUNED SOLAR SYSTEM

Copernicus's theory that Earth revolved around the Sun, seemed to relegate our planet to an ordinary status in the universe. However, if Earth was the center of our solar system, as Ptolemy and 16th century Catholic Church leaders had taught, we wouldn't be here. None of them, including Copernicus, knew that in order for human life to be possible, Earth needs to revolve around a Sun that has just the right size, location, and conditions as ours does.

But that is not all. We need other planets such as Jupiter and Mars to act as defense shields, protecting us from a potential catastrophic bombardment of comets and meteors. We also need a moon of just the right size and position to impact our tides and seasons. Let's take a look at just a few of the many conditions in our solar system that are just right for life.

- *The Sun's distance from the center of the galaxy*. Our Sun is positioned thousands of light-years from the center of the Milky Way, near one of its spiral arms.[13] This is the safest part of the galaxy, away from its highly radioactive center.
- *The Sun's mass not too large*. If the mass of the Sun were a small percentage greater, it would burn too quickly and erratically to support life.
- *The Sun's mass not too small*. On the other hand, if it were smaller, its greater flaring would disrupt Earth's rotation rate.
- *The Sun's metal content*. Only two percent of all stars have enough metal content to form planets. Too much metal in a star will allow too many planets to form, creating chaos. Our Sun has just the right amount of metal for planets to form safely.
- *Effect of the Moon*. The Moon stabilizes the Earth's tilt and is responsible for our seasons. If it weren't there, our tilt could swing widely over a large range, making our winters a hundred degrees colder and our summers a hundred degrees warmer.

When astronomers consider our remarkable solar system, they acknowledge that if it was slightly different, advanced biologi-

cal life would be impossible. But it is not enough to have the right universe, galaxy, and solar system for human life to be possible. The conditions of our home planet must also be fine-tuned to a razor's edge.

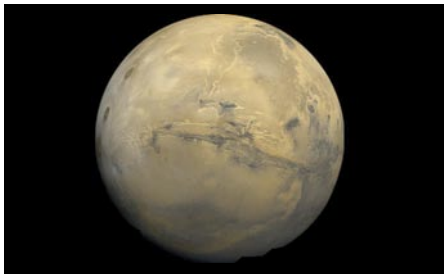
A FINELY TUNED PLANET

You may believe that aliens have sent life to Earth from a far distant galaxy (the premise of that memorable drama from 2004, *AVP: Alien vs. Predator*). You may believe that the government is hiding something outer spatial in Nevada's mysterious Area 51. Or you may simply believe that there is undoubtedly intelligent life on other planets. In any case, we have all been raised on the assumption that, given enough time, intelligent life will spring up anywhere in the cosmos (with perhaps a few more eyeballs or reptilian features). Yet new evidence from cosmology is really saying the opposite.

The reality is that we live on an extremely rare planet perfectly positioned in an extremely rare solar system, ideally located in an extremely rare galaxy, within a highly improbable universe. Let's look at our rare Earth.

- *Water*. Earth has an abundance of water, which is essential for life. Mars once had water and therefore might have harbored life. But water is only one of many requirements for life.

- *Oxygen*. Earth is the only planet in our solar system in which we can breathe. Attempting to breathe on other planets, such as Mars or Venus, would be instantly fatal, Mars having virtually no atmosphere and Venus having mostly carbon dioxide and almost no oxygen.



- *Earth's distance from the Sun*. If the Earth were merely one percent closer to the Sun, the oceans would vaporize, preventing the existence of life. On the other hand, if our planet were just two percent farther from the Sun, the oceans would freeze and the rain that enables life would be nonexistent.

- *Plate tectonic activity on Earth*. Scientists have determined that if the plate tectonic activity were greater, human life could not be sustained and greenhouse-gas reduction would overcompensate for increasing solar luminosity. Yet, if the activity was smaller, life-essential nutrients would not be recycled adequately and greenhouse-gas reduc

THE MATH MIRACLE

Implicit in all of the scientific discoveries of fine-tuning in the universe is the foundational importance of mathematics to exploring the nature of the universe. Because mathematics is the lens by which we study the universe, we can miss the genius behind the lens itself.

Physicist Eugene Wigner, in a widely quoted paper entitled "The Unreasonable Effectiveness of Mathematics in the Physical Sciences," notes that scientists often take for granted that the math they use to study and quantify the miracles of the universe is miraculous itself. Wigner states, "The enormous usefulness of mathematics is something bordering on the mysterious. … There is no rational explanation for it. … The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve."[14]

Such is the nature of mathematics that no one would claim to have invented an equation but only to have discovered or uncovered something that was always true. As the great scientist Johannes Kepler stated, "The chief aim of all investigations of the external world should be to discover the rational order and harmony which has been imposed on it by God and which He revealed to us in the language of mathematics."

Even as we calculate the extreme precision by which the universe was designed, we are alerted to yet another contour of design in the universe: the mathematical laws of physics.

tion would not compensate for increasing solar luminosity.

- *Ozone level in the atmosphere*. Life on Earth survives because the ozone level is within the safe range for habitation. However, if the ozone level were either much less or much greater, plant growth would be inadequate for human life to exist.

For life to exist, these, as well as many other conditions needs to be just right.[15]

ONE BLOOMING ROCK

University of Washington professors Peter Ward and Donald Brownlee conclude in their book, *Rare Earth*, that the conditions favorable for life must be so rare in the universe that "not only intelligent life, but even the simplest of animal life is exceedingly rare in our galaxy and in the universe."[16] This has led their readers to the conclusion expressed by the reviewer from the *New York Times*: "Maybe we are alone in the universe, after all."[17]

If Ward and Brownlee are right, what does that mean to us?

Michael Denton, senior research fellow in human molecular genetics at the University of Otago in New Zealand, tells us why this remarkable fine-tuning has reopened the discussion on the importance of man in our lonely universe. [18]

No other theory or concept imagined by man can equal in boldness and audacity this great claim … that all the starry heavens, and every species of life, that every characteristic of reality exists for mankind. … And today, four centuries after the scientific revolution, the doctrine is again reemerging. In the last decades of the twentieth century, its credibility is being enhanced by discoveries in several branches of fundamental science.

It seems ludicrous to claim that life exists on only one tiny speck in a universe of ten billion trillion stars. Yet, incredibly, Earth appears to sit alone in a hostile universe devoid of life, a reality portrayed recently in *National Geographic*:

> If life sprang up through natural processes on the Earth, then the same thing could presumably happen on other worlds. And yet when we look at outer space, we do not see an environment teeming with life.
>
> We see planets and moons where no life as we know it could possibly survive. In fact we see all sorts of wildly different planets and moons—hot places, murky places, ice worlds, gas worlds—and it seems that there are far more ways to be a dead world than a live one.[18]

The incredibly precise numerical values required for life confront scientists with obvious implications. Stephen Hawking observes, "The remarkable fact is that the values of these numbers seem to have been very finely adjusted to make possible the development of life."[19]

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WATER WORLD

It seems like every other day you see reports in the paper about scientists getting excited that water has been discovered on our Moon. Or on a planet in our solar system. Or on some other celestial body.

From the news stories, you might almost think that all it takes is a little water for life to exist somewhere. Is that true?

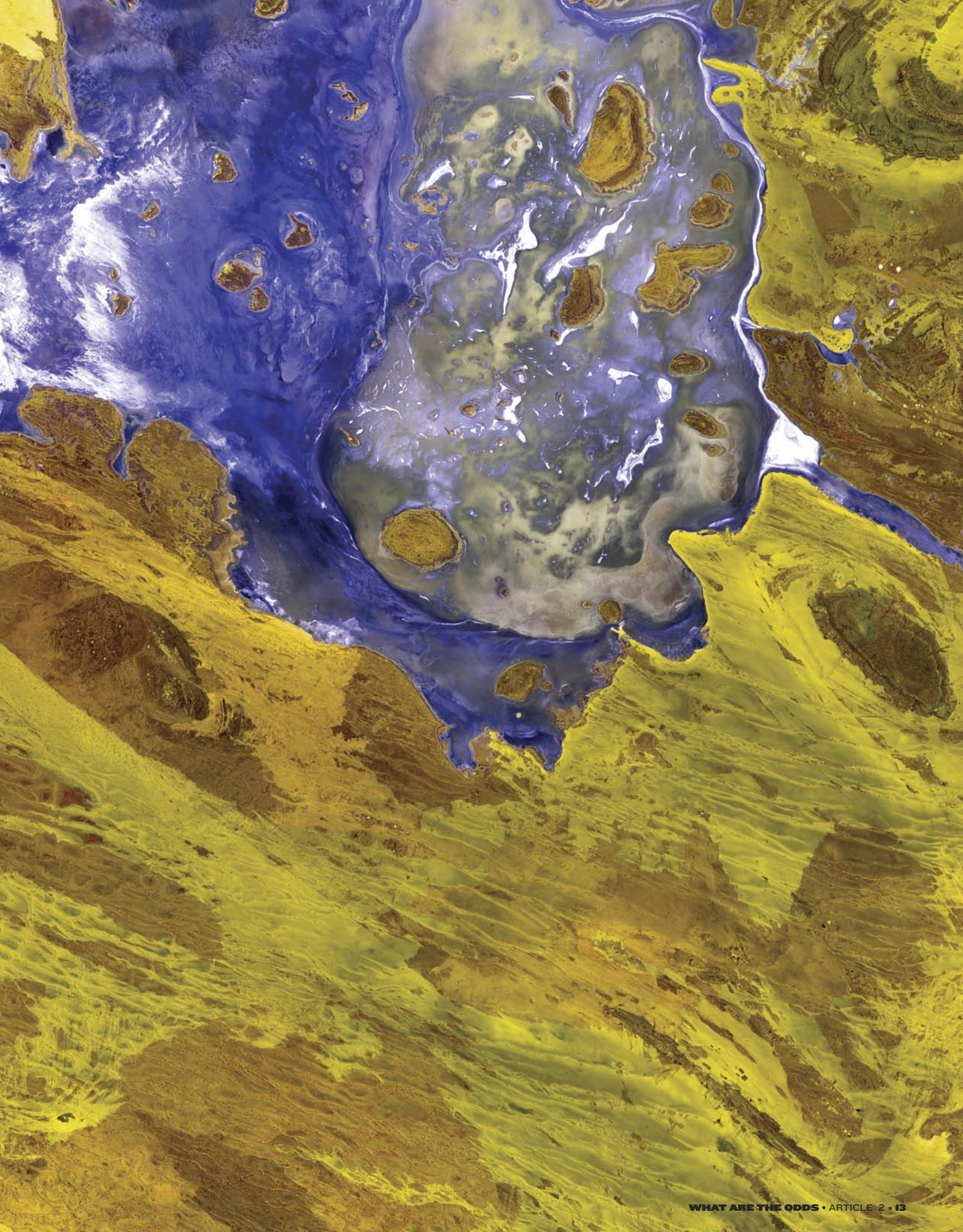
In his book *The Case for a Creator*, author Lee Strobel asks Dr. Guillermo Gonzalez, an astrobiologist at Iowa State University, can't one simply find a place in the universe where water stays liquid for a long enough period of time and eventually life may develop?

Gonzalez responds: "It's true that in order to have life you need water—which is the universal solvent—for reactions to take place, as well as carbon, which serves as the core atoms of information carrying structural molecules of life. But you also need a lot more. Humans require twenty-six essential elements; a bacterium about sixteen. The problem is that not just any planetary body will be the source of all those chemical ingredients in the necessary forms and amounts."[21]

Now here is the interesting follow-up question. Strobel asks whether, as science fiction writers have suggested, life couldn't develop in a "radically different form—for instance, creatures based on silicon instead of carbon." In other words, what about all those strange creatures we've seen on *Star Trek*?

Here is Gonzalez's response: "Chemistry is one of the better understood areas of science. We know that you just can't get certain atoms to stick together in sufficient numbers and complexity to give you large molecules like carbon can. You can't get around it. And you just can't get other types of liquids to dissolve as many different kinds of chemicals as you can with water."[22]

The point? Next time you hear about some ice on an asteroid, don't go looking for your distant cousins.



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