

American Minute with Bill Federer Faith of Famous Astronomers, and a church organist discovering a planet - Sir William Herschel

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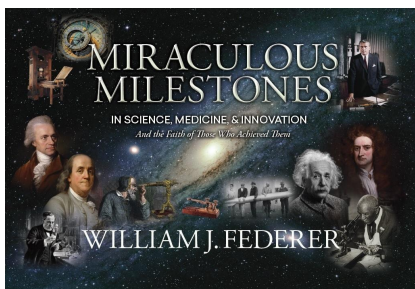
"When I consider thy **heavens**, the work of thy fingers, the **moon** and the **stars**, which thou hast ordained; What is **man**, that thou art **mindful of him?** and the **son of man**, that thou **visitest him?**" -Psalm 8:3-4



The **Solar System** consists of **eight planets**, along with dwarf planets and other small bodies.

The **Earth** is the **third planet** from the **Sun** ... [continue reading American Minute here ...](#)

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At the center of the **Solar System** is the **Sun**, at a distance of **93 million miles from the Earth**.

93 million miles is considered **one astronomical unit**.

It takes **8 minutes** for **light** to travel from the **Sun** to the **Earth**.

Light travels at **186,000 miles per second** or **5.88 trillion miles in a year = a light year**.

The word "**galaxy**" comes from the Greek word "galaxias" meaning "**milky**."

It was **Galileo**, the first astronomer to use a telescope, who resolved in 1610 that the **Milky Way** was not a celestial cloud but actually **a band of individual stars**.

There are an estimated **400 billion stars** in the **Milky Way Galaxy**.

The **next star** closest to our Sun is **Proxima Centauri**, at a distance of 4.2465 light years away.

The **distance of stars** is determined by **parallax observations**.

Parallax observations are made by looking at the same stars from **different positions** as the **Earth** travels in its **orbit around the Sun**.

The **closer stars** appear to show greater movement in **relation** to the **distant stars behind them**.

Milky Way Galaxy is **100,000 light years across**.

The **Milky Way** was thought to be the **only galaxy** in the universe until 1920, when **Edwin Hubble** proved it was just **one of many galaxies**.

In 1925, **Hubble** discovered the **Andromeda Galaxy**, the next closest galaxy, **2.5 million light**

years from Earth.

The **Andromeda Galaxy** contains a **trillion stars**, twice as many as the Milky Way.



Next closest galaxy is Andromeda Galaxy
discovered by Edwin Hubble in 1925

In 1790, **Sir William Herschel** discovered what he thought was a star cluster or nebula.

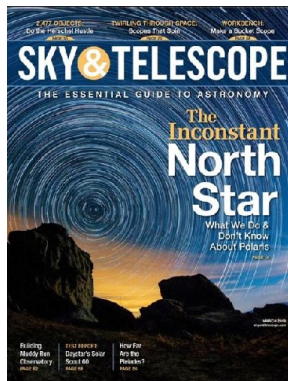
He listed it in his Index Catalogue as **IC1101**.

It was later discovered to possibly be the **largest galaxy in the universe**.

The **IC1101 galaxy** is a billion light years from Earth, contains **100 trillion stars**, and measures over **2 million light years across**.

This make our **Milky Way** seem small by comparison, with only **400 billion stars** and **100,000 light years across**.

In 1941, ***Sky & Telescope Magazine*** was founded by **Charles A. Federer**, a noted illustrator and cousin of **Richard Louis Federer**, father of this article's author.



ABOUT SKY & TELESCOPE

Sky & Telescope magazine, founded in 1941 by Charles A. Federer Jr. and Helen Spence Federer, has the largest, most experienced staff of any astronomy magazine in the world. Its editors are virtually all amateur or professional astronomers, and every one has built a telescope, written a book, done original research, developed a new product, or otherwise distinguished him or herself. Find out more about the [editorial and arts staff](#) of *Sky & Telescope*, or read on for a historical perspective on the magazine.

The **Milky Way Galaxy**, the **Andromeda Galaxy**, the **Triangulum Galaxy**, together with **80 dwarf galaxies**, form a cluster of galaxies called the the **Local Group**, so

named by astronomer **Edwin Hubble**.

The **Local Group** is located within a larger group of galaxies called the **Virgo Supercluster**.

The **Virgo Supercluster** is located within an even larger group of galaxy clusters called **Laniakea Supercluster**.

Laniakea is the **Hawaiian word** for **immense heaven**.

The **Laniakea Supercluster** contains over **100,000 galaxies**.

It is just one of countless **super clusters** in the **known Universe**.

There are an estimated **200 billion galaxies in the universe**, containing **10^{22} to 10^{24} stars**, or over **2 trillion trillion stars**.

The largest star found is **Stephenson 2-18**.

It is **so large** that if placed in **our Solar System** it would engulf the **orbit of Saturn -- the 6th planet from the Sun**.

To get an idea of the immense size of space, in 1990, the **Hubble Telescope** was launched.

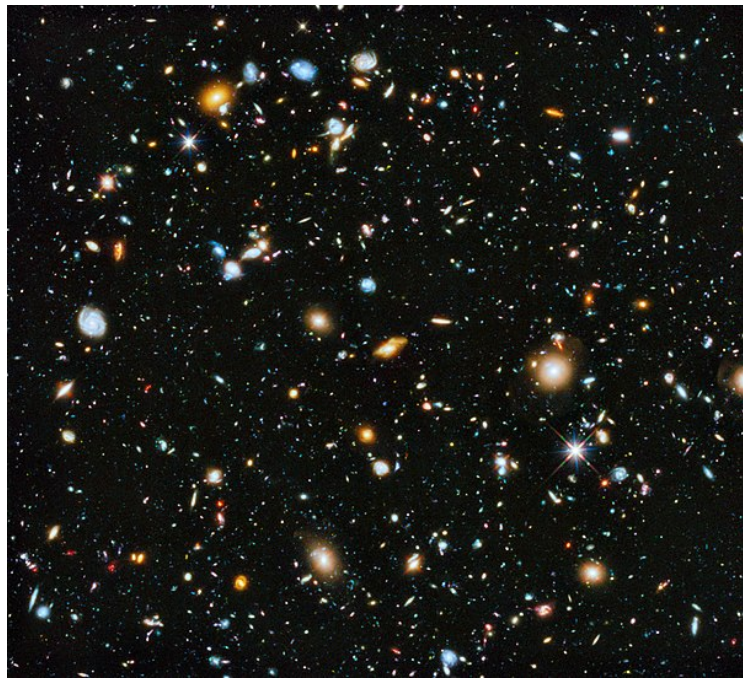
In 1995, for ten days, the telescope focused on the **Hubble Deep Field**, a spot the size of a **tennis ball** a **football field** away.

The spot was found to contain nearly 3,000 distant galaxies.

In 2003-2004, the telescope was focused for a total of 11 days on an even tinier spot, where there appeared to be nothing, in the sky southwest of the constellation Orion -- the **Hubble Ultra Deep Field**.

The area was the size of a grain of sand held at arm's length.

After a month of multiple exposures, a photo was compiled showing that it contained over **10,000 galaxies**, with **hundreds of billions of stars** in each.



The photo revolutionized astronomers' understanding of the universe.

As light travels in waves, with blue being the shorter wave and **red the longer**, many of the distant galaxies had a **red shift**, indicating they are **moving away from the Earth**.

In 1931, **astronomer Edwin Hubble** invited **Einstein** to the **Mount Wilson Observatory** in Pasadena, California.

After viewing the “**red shift**” of distant stars revealing an **expanding universe**, **Einstein** remarked:

“I now see the necessity of a **beginning**.”

It was determined that **the furthest galaxies** were **47 billion light years** away.

After observing in the opposite direction galaxies the same distance away, it was estimated that the **observable universe** is **93 billion light years** across.

What is even more astounding is the that the **universe** is

still **expanding at the speed of light.**

Psalm 19:1 states:

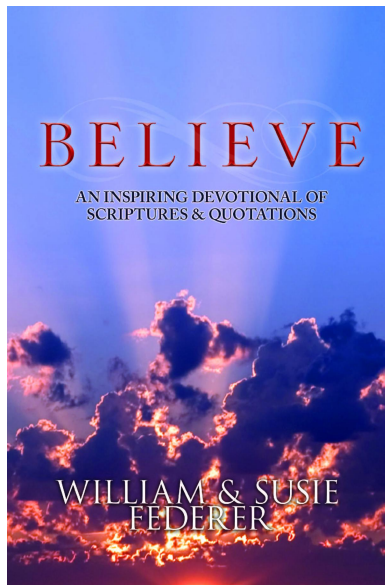
"The **heavens** declare the glory of **God.**"

Psalm 50:6 states:

"The **heavens** proclaim **His righteousness.**"

Isaiah 45:12 states:

"Thus saith the Lord, the Holy One of Israel ... I, even my hands, have **stretched out the heavens.**"



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There have been many famous astronomers throughout history.

- **Aristarchus of Samos** (c.310 BC- c.230 BC);
- **Hipparchus** (c.190 BC-c.120 BC);
- **Ptolemy** (c.90-c.168 AD);
- **Aryabhata** (476-550);
- **Al-Kindi** (c.801-c.873);
- **Bhaskara** (1114-1185);

- **Nasir al-Din al-Tusi** (1201-1274).

Polish astronomer **Nicolaus Copernicus** (1473-1543), made a major contribution to **the scientific revolution**.

He discovered that the **planets did not revolve around the Earth (geocentric)**, but that the Earth and the other planets in the solar system **revolved around the Sun (heliocentric)**.

Copernicus, who had a doctorate in cannon church law, wrote:

"The **Universe**, wrought for us by a supremely good and orderly **Creator**."

Copernicus wrote:

"To know the mighty works of **God**, to comprehend His wisdom and majesty and power; to appreciate, in degree, the wonderful workings of His laws, surely all this must be a pleasing and acceptable mode of worship to the **Most High**, to whom ignorance cannot be more grateful than knowledge."

He added:

"I am aware that a philosopher's ideas are not subject to the judgment of ordinary persons, because it is his endeavor to seek the truth in all things, to the extent permitted to human reason by **God**."

Italian astronomer **Galileo Galilei** (1564-1642) **supported Copernicus' heliocentric theory**, and also confirmed the phases of Venus, discovered four of Jupiter's moons, observed Saturn's rings, and analyzed sunspots.

Galileo Galilei stated:

- "I give infinite thanks to **God**, who has been pleased to make me the first observer of marvelous things."
- "Mathematics is the language in which **God** has written the universe."
- "The laws of nature are written by the **Hand of God** in the language of mathematics."
- "**God** is known by nature in His works, and by doctrine in His revealed **Word**."
- "The prohibition of science would be contrary to the **Bible** which in hundreds of places teaches us how the greatness and glory of **God** shine forth marvelously **in all His works**, and is to be read above all in **the open book of the heavens**."

Danish astronomer **Tycho Brahe** (1546-1601) was the last major naked-eye astronomer, who compiled very accurate astronomical and planetary observations.

Tycho Brahe stated:

"Those who study the stars have **God** for a teacher."

Brahe wrote in *On Recent Phenomena in the Aetherial World*, 1588:

"That the machine of **Heaven** is ... divinely governed under a given **law**."

In observing a super nova, **Tycho Brahe** wrote *On the New Star*, 1573:

"I noticed that **a new and unusual star**, surpassing all others in brilliancy ... it was quite evident to me that there had never before been any star in that place in the sky ...

A miracle indeed, either the greatest of all that have

occurred in the whole range of nature **since the beginning of the world**, or one certainly that is to be classed with those attested by **the Holy Oracles.**"

German astronomer **Johannes Kepler** (1571-1630), **assisted Tycho Brahe** and studied his observations.

Kepler discovered the **laws of planetary motion.**

Kepler, who originally studied to be a priest at the University of Tübingen, wrote:

- "I had the intention of becoming a theologian ... but now I see how **God** is, by my endeavors, also glorified in astronomy, for 'the heavens declare the glory of **God.**'"
- "I believe only and alone in the service of **Jesus Christ.** In him is all refuge and solace."
- "Science is the process of thinking **God's** thoughts after **Him.**"

Kepler wrote:

- "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."
- "The wisdom of the **Lord** is infinite as are also His glory and His power. Ye heavens, sing His praises; sun, moon, and planets, glorify Him in your ineffable language! Praise Him, celestial harmonies, and all ye who can comprehend them! And thou, my soul, praise thy **Creator!** It is by Him and in Him that all exist."

Johannes Kepler remarked:

"Since we astronomers are priests of the highest **God** in regard to the book of nature, it befits us to be thoughtful, not of the glory of our minds, but rather, above all else, of the glory of **God.**"

He stated:

"It is a right, yes a duty, to search in cautious manner for the numbers, sizes, and weights, the norms for everything **God** has created.

For He himself has let man take part in the knowledge of these things ...

For these secrets are not of the kind whose research should be forbidden; rather they are set before our eyes like a mirror so that by examining them we observe to some extent the goodness and wisdom of the **Creator.**"

Kepler added:

"Those laws are within the grasp of the human mind. **God** wanted us to recognize them by creating us after his own image so that we could share in his own thoughts ... and if piety allow us to say so, our understanding is in this respect of the same kind as the **divine**, at least as far as we are able to grasp something of it in our mortal life."

Sir Isaac Newton constructed **one of the first practical reflecting telescopes.**

He wrote in *Principia*, 1687:

"This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of **an intelligent and powerful Being** ...

All variety of created objects which represent order and life in the universe could happen only by the willful

reasoning of **its original Creator**, whom I call the '**Lord God.**'"

In 1781, the same year the American Revolution ended, **William Herschel** discovered the first planet since ancient antiquity.

He desired to name the planet **Georgium Sidus** (George's Star), after King George III.

Others wanted to give it the name of **Herschel**, as **Thomas Jefferson** wrote from Paris to John Page, August 20, 1785:

"You will find in these the tables for the **planet Herschel**, as far as the observations hitherto made ... You will see ... that **Herschel** was ... the first astronomer who discovered it to be a planet."

Born in Germany, November 15, 1738, **William Herschel** was a **musician** like his father, who was **bandmaster** in the Hanoverian guard.

William Herschel was a contemporary of **Beethoven**, **Haydn**, and **Mozart**.

During the **Seven Years War**, which in America was called the **French and Indian War** (1756-1763), **William Herschel** fled to England.

There, he was hired as the **first organist** at **St John the Baptist Church** in **Halifax**, and then **organist** at the prestigious **Octagon Chapel in Bath**, eventually writing 24 symphonies.

An album of his music was released in 1995 titled: **Sir William Herschel - Music by the Father of Modern Astronomy: First Recordings of the orchestrated chamber works by the celebrated 18th century composer/astronomer.**

William Herschel pursued astronomy on the side, building his own telescope to observe, not just the solar system, but "the construction of the heavens."

He taught himself how to grind and polish telescopic mirrors, becoming preeminent in that field.

His sister, **Caroline Herschel** (1750-1848), assisted him, and went on to become a renown astronomer in her own right as **the first professional female astronomer**.

Caroline Herschel received royal recognition for discovering several comets, one of which was named for her, and for discovering M110, the Andromeda Galaxy's second known companion.

A crater on the Moon is named for her.

William Herschel constructed over 400 telescopes, including **the largest reflecting telescopes of his day**, using them to **catalog over 90,000 new stars**, as well as **nebulae** and **galaxies**.

Herschel discovered **Uranus** on March 13, 1781. It is the 3rd largest planet in our solar system, and 7th planet from the sun.

Uranus, named after the mythological Greek god of the sky, is basically tied with Neptune for having the coldest atmospheric surface temperature, reaching minus 371 degrees Fahrenheit, resulting in both planets being classified as "ice giants."

After **Herschel's** discovery of **Uranus**, **King George III** granted him a **permanent salary** as a **royal astronomer**.

The **King** had him move to **Windsor** so the Royal Family could look through his telescopes.

William Herschel identified **double-stars**, coined the word "**asteroid**," meaning star-like, and **discovered infrared radiation**.

The Scientific Papers of Sir William Herschel

(published by the Royal Society in 1912), recorded a diary entry Herschel made after meeting Napoleon in Paris in August of 1802.

When French scholar Pierre-Simon LaPlace tried to explain creation as a result of naturalistic causes, **Herschel** recounted:

"The First Consul (Napoleon) ... asked in a tone of exclamation ... when we were speaking of the extent of the sidereal heavens '**and who is the author of all this**' ...

LaPlace wished to shew that a chain of natural causes would account for the construction ... This the First Consul (Napoleon) rather opposed."

Herschel added:

"Much may be said on the subject; by joining the arguments of both we shall be led to '**Nature and Nature's God.**'"

The Royal Society editor wrote in a footnote of **Herschel's** missing letters:

"Some 400 pages ... are still extant (existing) ... We are informed that **Herschel** in them interweaves his philosophy and even his musical studies with references of an earnest kind to the **Creator** as a **beneficent Deity**, expressing his gratitude and **addressing Him in a prayerful spirit.**"

William Herschel was made a Knight of the Royal Guelphic Order by Prince Regent, George IV, in 1816.

Sir William Herschel died in his observatory, August 25, 1822.

He was buried in **St. Laurence Anglican Church** in Slough, England, where a stained-glass "**Herschel Window**" commemorates his astronomical discoveries, with another window quoting **Psalm 8**:

"When I consider the **heavens**, the work of Thy fingers, the **moon** and the **stars**, which Thou hast ordained, **what is man, that Thou art mindful of him?**"

A contemporary of **Sir William Herschel** was the famous English poet, **Edward Young** (1681-1765), whose poem "**Night Thoughts**" was published in 1742.

The poem became so popular it was translated into French, German, Italian, Spanish, Portuguese, Swedish and Magyar, and quoted throughout Europe and America.

Line 771 of **Edward Young's** poem "**Night Thoughts**" is thought to be a reference to **Sir William Herschel**:

"By mortal ear, **the glorious Architect**,

In this His universal temple hung

With lustres, with innumerable lights,

That shed **religion** on the soul; at once,

The temple, and the preacher! O how loud

It calls devotion! genuine growth of Night!

Devotion! daughter of Astronomy!

An undevout astronomer is mad."

William Herschel initially encouraged his son, **John Frederick Herschel**, to enter the ministry.

John married **Margaret Stewart**, the daughter of a Scottish Presbyterian.

When his father died, **John** took his inheritance and his father's telescope and sailed with his wife to **South Africa**.

There, he cataloged hundreds of new stars and nebulae seen from the **southern hemisphere**.

He observed double stars, the Great Eruption of the stellar system Eta Carinae, and return of **Halley's Comet**, named for astronomer Edmond Halley, **which returns every 75.32 years**.

John Herschel wrote in a letter to Charles Babbage (*The Shadow of the Telescope: A Biography of John Herschel* by Günther Buttman, p. 14):

"God knows how ardently I wish I had ten lives."

In a diary entry, November 1855, **John Herschel** wrote:

"What **God** sends is welcome."

John Herschel is quoted in *The Athenaeum, Journal of English Foreign Literature, Science, and the fine arts* (London, June 16, 1838, p. 555), as referring to:

"God's great book of nature."

While in South Africa, **Herschel** read Charles Lyell's *Principles of Geology: being an attempt to explain the former changes of the Earth's surface, by reference to causes now in operation* (1830-1833).

Though **Lyell** rejected the transmutation of species, his

book espoused a **novel theory of uniformitarianism**, that geological changes in the past happened gradually, in direct contrast to **the accepted theory of catastrophism**.

Influenced by **Lyell's** book, **John Herschel** wrote:

"Time! Time! Time! — we must not impugn (attack) the Scripture chronology, but we must interpret it in accordance with whatever shall appear on fair inquiry to be the truth for there cannot be two truths.

And really there is scope enough: for the lives of the Patriarchs may as reasonably be extended to 5000 or 50000 years apiece as **the days of Creation** to as many thousand millions of years."

While **Herschel** was in South Africa, the *HMS Beagle* landed at Cape Town, South Africa, on June 3, 1836.

A passenger disembarked, the young **Charles Darwin**, who spent time visiting **John Herschel**.

Herschel's fascination with **Lyell's** long ages for creation may have influenced **Darwin** in the development of his theory.

The **long ages view** was a departure from views held by other famous astronomers, such as **Johannes Kepler**, who, after writing his book *The Harmony of the World* (1619), stated:

"See, I cast the die, and I write the book.

Whether it is to be read by the people of the present or of the future makes no difference: let it await its reader for a hundred years, **if God himself has stood ready for 6,000 years for one to study Him.**"

Astrophysicist Hugh Ross stated:

"The age of the Earth makes no difference with respect to **Christ's atoning sacrifice for humanity's sin** or to the **nature and character of God.**"

Ross added:

"What's true will never contradict what's true. Article 2 of the Belgic Confession, based on Psalm 19, Romans 1, and several other texts, declares that God has given us two reliable revelations: the **words of Scripture** and the **facts of nature.**

Thus, it would be impossible for the facts of nature ever to contradict **the words of the Bible.**"

During the later part of his life, **Sir John Frederick Herschel** was one of the most sought after men of science in Britain.

He advocated for public education "to fit (students) for a higher state of existence, by teaching them those (things) which connect them with their **Maker and Redeemer.**"

Dying on May 12, 1871, he was buried in Westminster Abbey next to Sir Isaac Newton.

Sir John Herschel was quoted by Marcel de Serres in "On the Physical Facts in the Bible Compared with the Discoveries of the Modern Sciences" (*The Edinburgh New Philosophical Journal*, 1845, Vol. 38, 260):

"**All human discoveries** seem to be made only for the purpose of **confirming more strongly the truths come from on high, and contained in the Sacred Writings.**"

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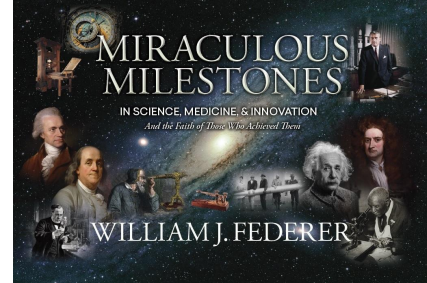


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