2020 Spring Meeting

- Buddy Payne
  - Design at the Macroscopic Level: Rare Earth
  - Design at the Microscopic Level: Evidence for Design in the Cell
  - Design at the Microscopic Level: What about Junk DNA?
  - Magnificent Obsession
  - The Design Inference: Seeing Intelligent Design in the Natural World
  - Dinosaurs and Biblical Creation

https://montevistacoc.com/multimedia-category/lesson-type/gospel-meeting/spring-meeting-2020/

A Biblical Accounting of Time

Age of the Earth?

Age of the Earth?

- 6 easy to remember steps
  - Jesus
  - Zerubbabel / Restoration / Return from Captivity
  - David
  - Moses
  - Patriarchs
  - Noah
  - Adam

2000

Industrial Revolution

Macro View

Micro View

Bible Availability

1500

Columbus

Sailed to America

Luther

Religious Reformation

1000

Middle Ages

Guido D'Arezzo
Musical Reformation

500

Rome Fallen

Middle Ages Start

Catholic Church
Social / Political

0

Jesus

2000 years ago

500 BC

Zerubbabel

City is Rebuilt
Wall is Rebuilt
Temple is not Rebuilt

1000 BC

King David

1500 BC

Moses

2000 BC

Patriarchs

Abraham

Isaac

Jacob → Israel

2500 BC

Noah

Flood

4000 BC

Adam

6th Day

Adam - Patriarchs David Jesus Middle Ages Today

- Noah Moses Zerub'l ~~Rome~~ Columbus

6000 Years

Adam - Patriarchs David Jesus Middle Ages Today

\- Noah Moses Zerub'l ~~Rome~~ Columbus

- 6 easy to remember steps…

0	Jesus
500	Zerubbabel / Restoration / Return from Captivity
1000	David
1500	Moses
2000	Patriarchs
2500	Noah
4000	Adam

Adam - Patriarchs David Jesus Middle Ages Today

- Noah Moses Zerub'l ~~Rome~~ Columbus

Adam to Noah

- Genesis 5

  Genealogy of Adam

- Genesis 7:6

  Noah's age (flood)

The Family of Adam

5 This is the book of the [a]genealogy of Adam. In the day that God created man, He made him in [b]the likeness of God. 2 He created them [c]male and female, and [d]blessed them and called them Mankind in the day they were created. 3 And Adam lived one hundred and thirty years, and begot *a son* [e]in his own likeness, after his image, and [f]named him Seth. 4 After he begot Seth, [g]the days of Adam were eight hundred years; [h]and he had sons and daughters. 5 So all the days that Adam lived were nine hundred and thirty years; [i]and he died.

6 Seth lived one hundred and five years, and begot [j]Enosh. 7 After he begot Enosh, Seth lived eight hundred and seven years, and had sons and daughters. 8 So all the days of Seth were nine hundred and twelve years; and he died.

9 Enosh lived ninety years, and begot [1]Cainan. 10 After he begot Cainan, Enosh lived eight hundred and fifteen years, and had sons and daughters. 11 So all the days of Enosh were nine hundred and five years; and he died.

12 Cainan lived seventy years, and begot Mahalalel. 13 After he begot Mahalalel, Cainan lived eight hundred and forty years, and had sons and daughters. 14 So all the days of Cainan were nine hundred and ten years; and he died.

15 Mahalalel lived sixty-five years, and begot Jared. 16 After he begot Jared, Mahalalel lived eight hundred and thirty years, and had sons and daughters. 17 So all the days of Mahalalel were eight hundred and ninety-five years; and he died.

18 Jared lived one hundred and sixty-two years, and begot [k]Enoch. 19 After he begot Enoch, Jared lived eight hundred years, and had sons and daughters. 20 So all the days of Jared were nine hundred and sixty-two years; and he died.

21 Enoch lived sixty-five years, and begot Methuselah. 22 After he begot Methuselah, Enoch [l]walked with God three hundred years, and had sons and daughters. 23 So all the days of Enoch were three hundred and sixty-five years. 24 And [m]Enoch walked with God; and he *was* not, for God [n]took him.

25 Methuselah lived one hundred and eighty-seven years, and begot Lamech. 26 After he begot Lamech, Methuselah lived seven hundred and eighty-two years, and had sons and daughters. 27 So all the days of Methuselah were nine hundred and sixty-nine years; and he died.

28 Lamech lived one hundred and eighty-two years, and had a son. 29 And he called his name [o]Noah, [2]saying, "This *one* will comfort us concerning our work and the toil of our hands, because of the ground [p]which the LORD has cursed." 30 After he begot Noah, Lamech lived five hundred and ninety-five years, and had sons and daughters. 31 So all the days of Lamech were seven hundred and seventy-seven years; and he died.

32 And Noah was five hundred years old, and Noah begot [q]Shem, Ham, [r]and Japheth.

1056 Years

The Family of Adam

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Adam to Noah

- Genesis 5

  Genealogy of Adam

  1056 year

- Genesis 7:6

  Noah's age (flood)

  600 year

Adam to Noah

- Adam to Noah is 1056 years
- Noah is 600 years old during the flood
- Shem is 100 years old during the flood

Adam to Noah

- Adam to Noah is 1056 years
- Noah is 600 years old during the flood
- Shem is 100 years old during the flood

Noah to Patriarchs

- Genesis 11:10-26

  Genealogy of Shem

- Genesis 21:5

  Age of Abraham

  when Isaac was born

Shem's Descendants

10 [n]This *is* the genealogy of Shem: Shem *was* one hundred years old, and begot Arphaxad two years after the flood. 11 After he
begot Arphaxad, Shem lived five hundred years, and begot sons and daughters.
12 Arphaxad lived thirty-five years, [o]and begot Salah. 13 After he begot Salah, Arphaxad lived four hundred and three years,
and begot sons and daughters.
14 Salah lived thirty years, and begot Eber. 15 After he begot Eber, Salah lived four hundred and three years, and begot sons and
daughters.
16 [p]Eber lived thirty-four years, and begot [q]Peleg. 17 After he begot Peleg, Eber lived four hundred and thirty years, and begot
sons and daughters.
18 Peleg lived thirty years, and begot Reu. 19 After he begot Reu, Peleg lived two hundred and nine years, and begot sons and
daughters.
20 Reu lived thirty-two years, and begot [r]Serug. 21 After he begot Serug, Reu lived two hundred and seven years, and begot
sons and daughters.
22 Serug lived thirty years, and begot Nahor. 23 After he begot Nahor, Serug lived two hundred years, and begot sons and
daughters.
24 Nahor lived twenty-nine years, and begot [s]Terah. 25 After he begot Terah, Nahor lived one hundred and nineteen years, and
begot sons and daughters.
26 Now Terah lived seventy years, and [t]begot [4]Abram, Nahor, and Haran.

392 Years

Shem's Descendants

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Noah to Patriarchs

- Genesis 11:10-26

  Genealogy of Shem

392 years

- Genesis 21:5

  Age of Abraham

  when Isaac was born

100 years

Noah to Patriarchs

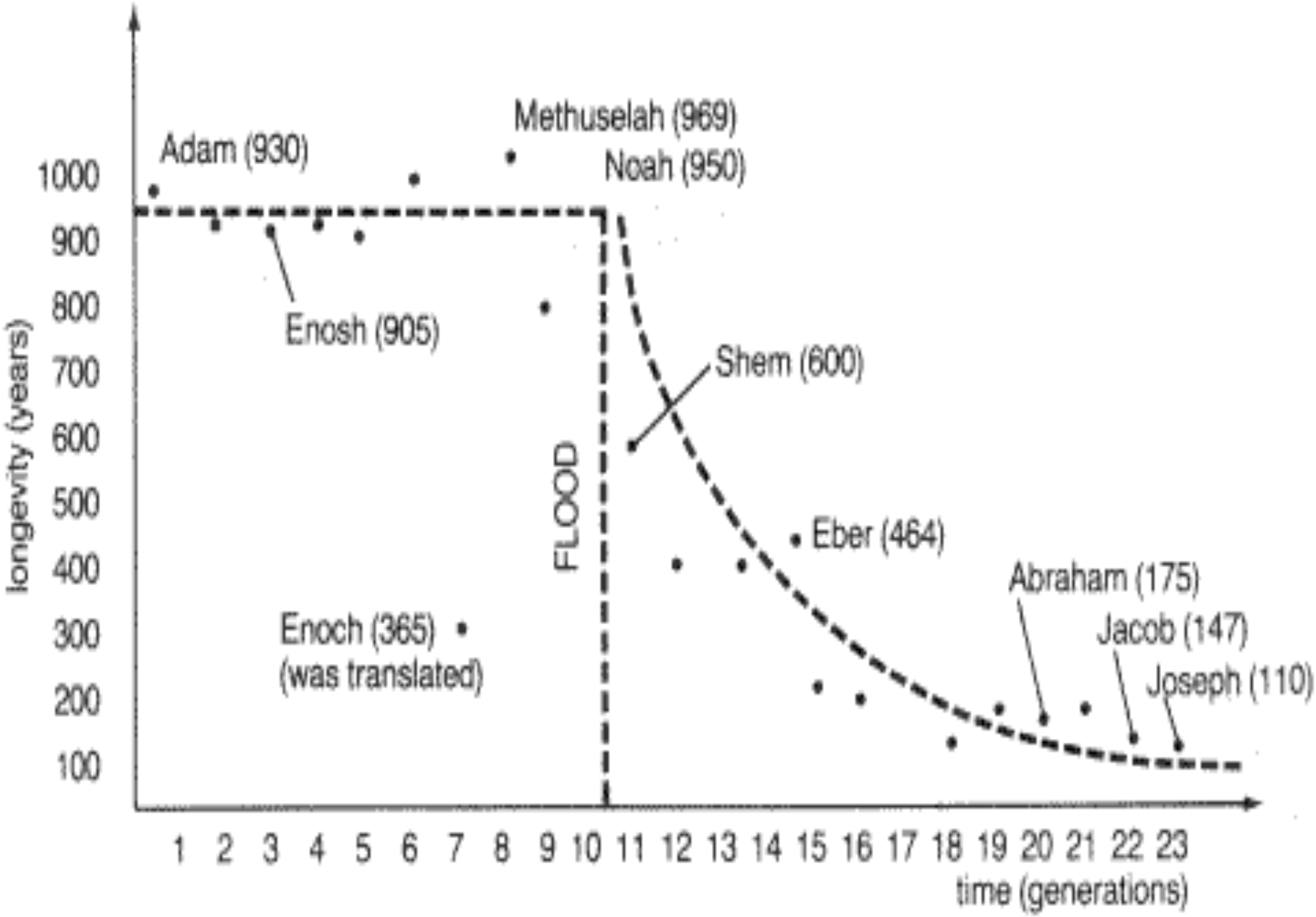
- Shem to Abraham is 392 years
- Abraham is 100 years old when Isaac was born

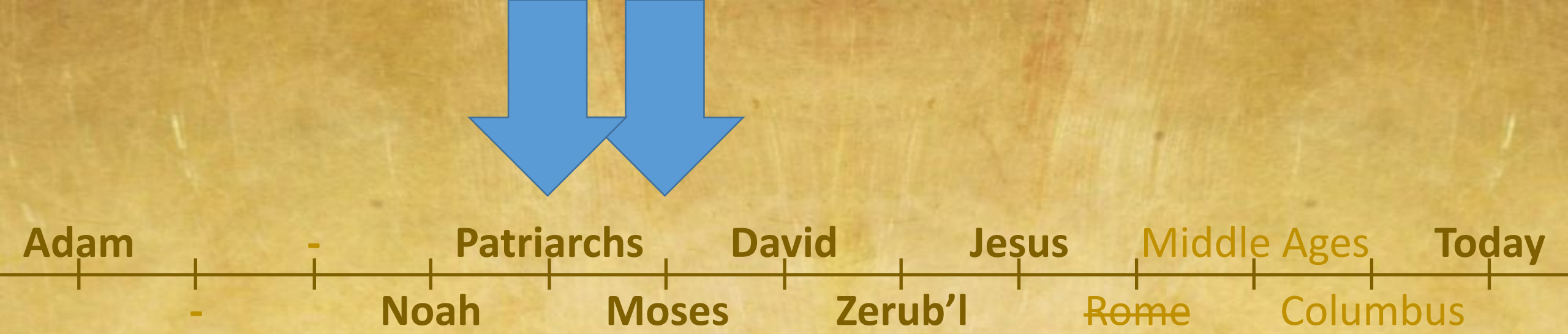
Noah to Patriarchs

- Shem to Abraham is 392 years
- Abraham is 100 years old when Isaac was born

Noah to Patriarchs

- Shem to Abraham is 392 years
- Abraham is 100 years old when Isaac was born
- Isaac is 60 years old when Jacob is born
- Jacob is renamed by God to Israel
- Jacob has 12 sons, the 12 tribes of Israel
- Jacob is 130 years old when settling in Egypt


Adam (930)
Methuselah (969)
Noah (950)
Enosh (905)
Shem (600)
FLOOD
Eber (464)
Abraham (175)
Jacob (147)
Joseph (110)
Enoch (365)
(was translated)
longevity (years)
1000
900
800
700
600
500
400
300
200
100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
time (generations)



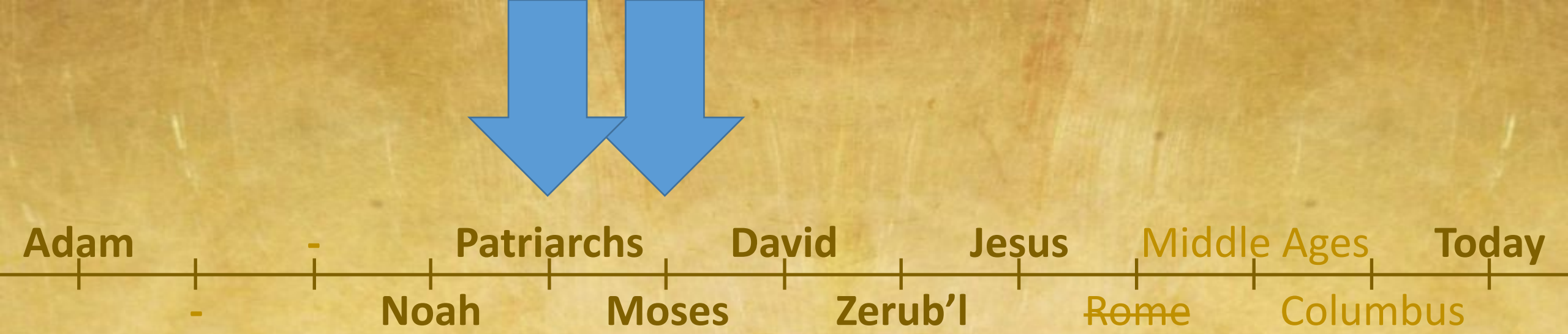
Patriarchs to Moses

Genesis 15:13

Children of Israel
will be afflicted for
400 years

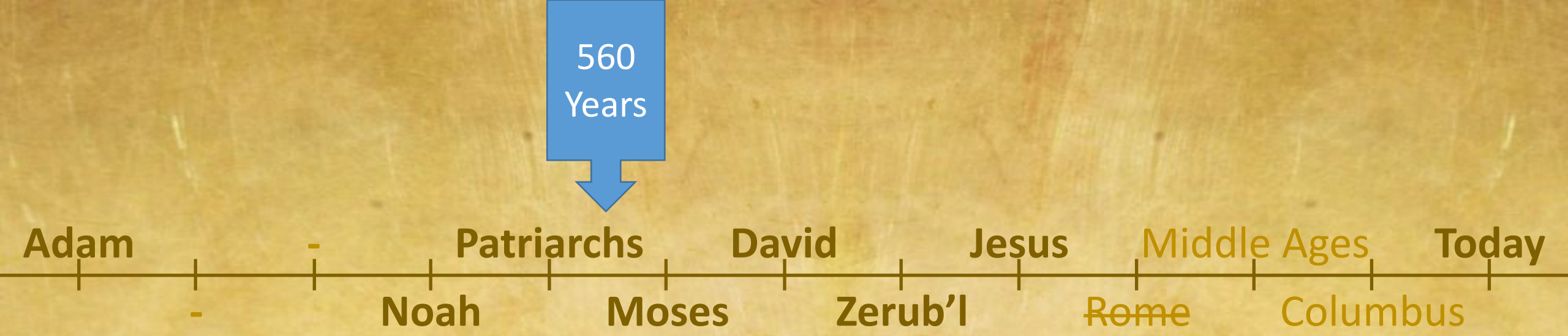
Exodus 12:40

Exactly 430 years
the Children of Israel
Lived in Egypt



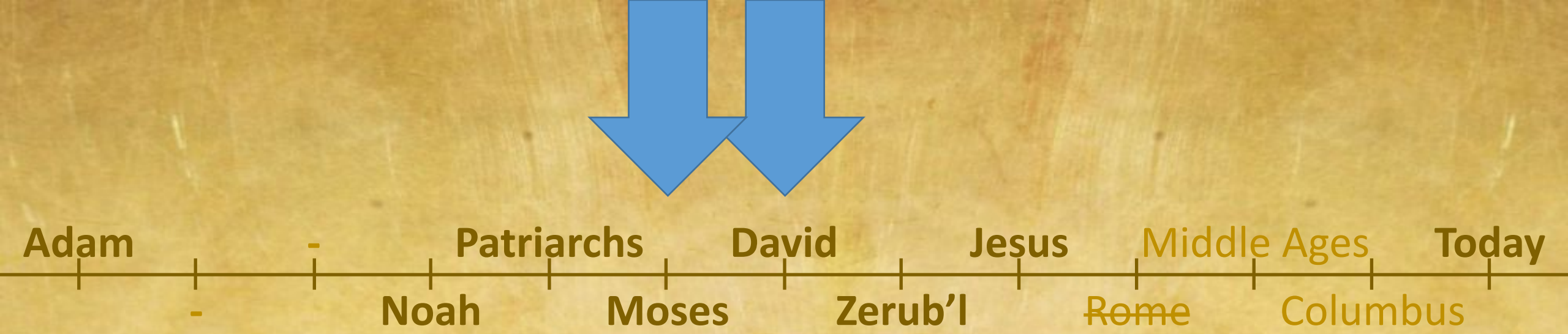
Patriarchs to Moses

- Jacob is 130 years old when settling in Egypt
- Exactly 430 years in Egypt



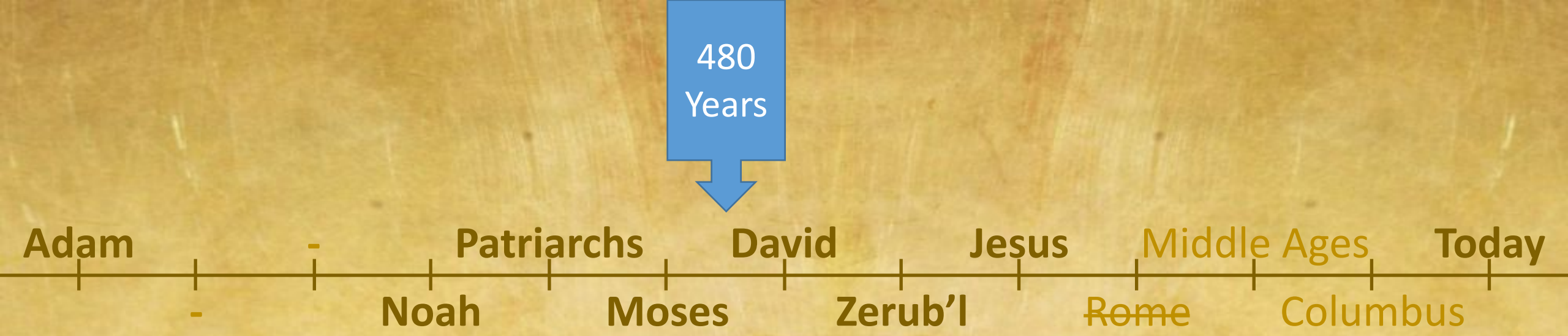
Patriarchs to Moses

- Israel is 130 years old when settling in Egypt
- Exactly 430 years in Egypt when nation of Israel left



Moses to David

- Period of the Judges have challenges
- No longer detailed genealogical records
- 1 Kings 6:1 Solomon starts the temple 480 years after the exodus from Egypt.



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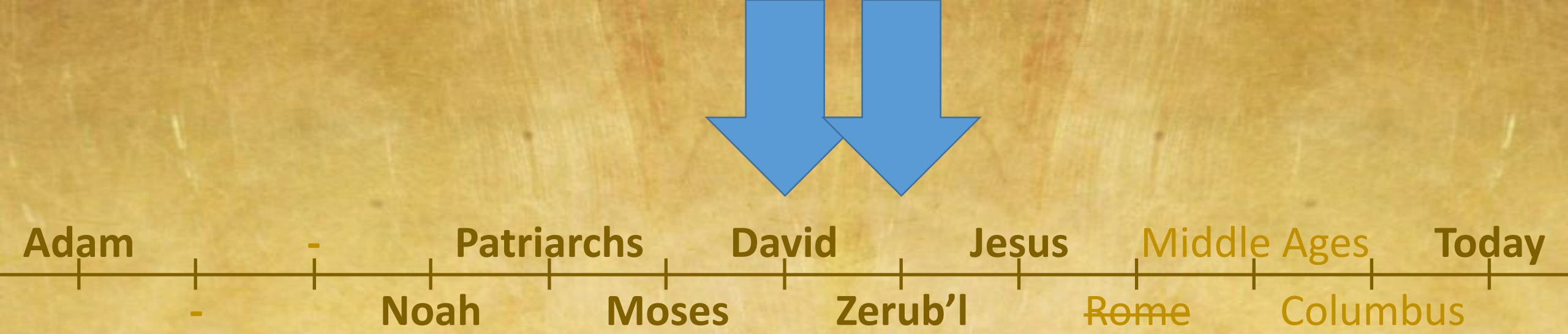
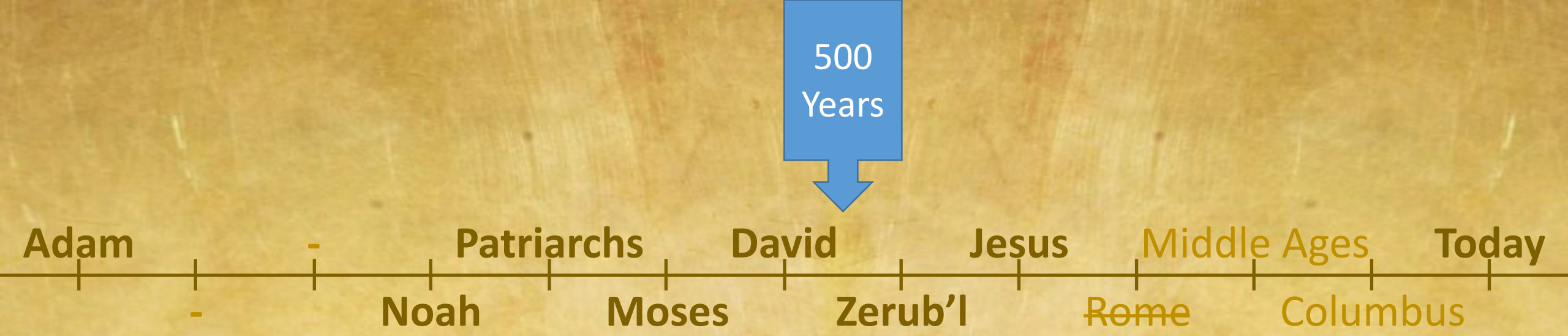


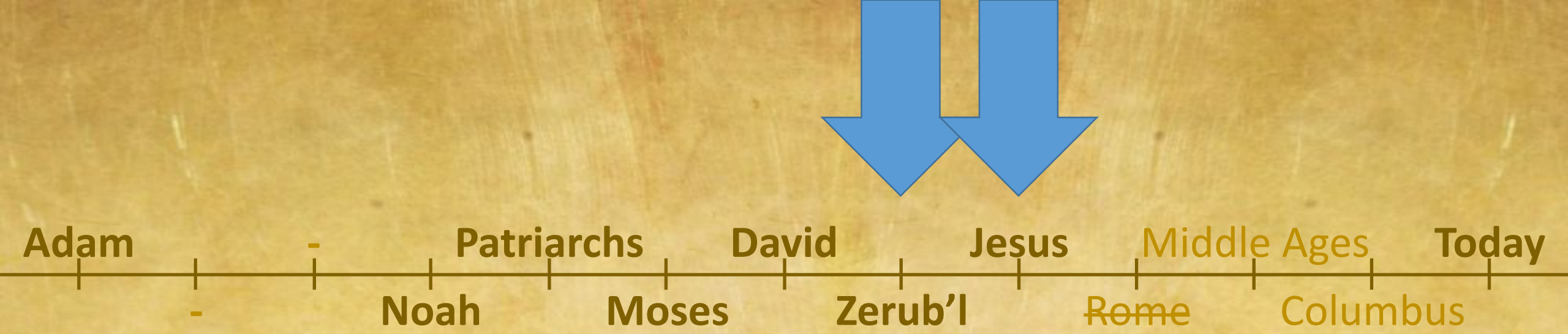
David to Restoration

- Written history is a staple part of the historical record
- Genealogical record is replaced by a Ruling record



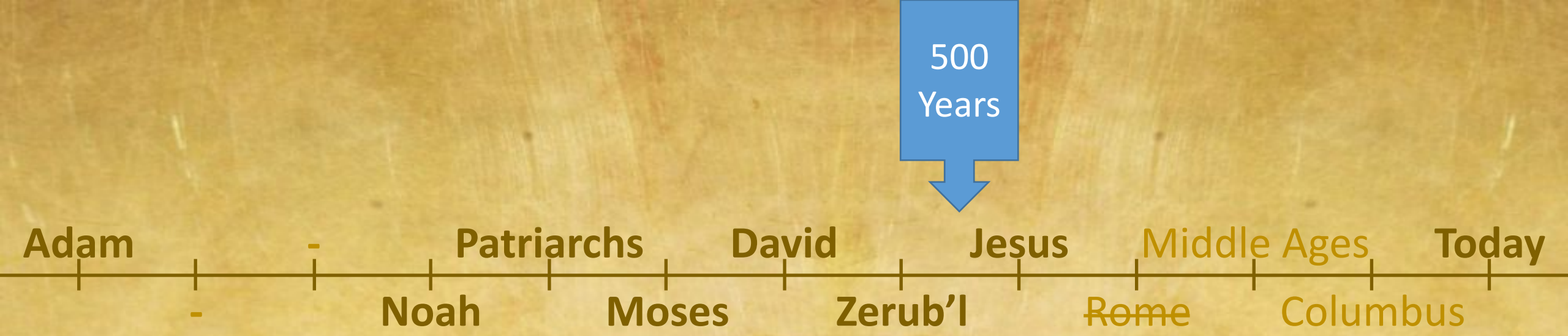
David to Restoration

- Written records are a staple part of history!
- Genealogical record is replaced by a Ruling record



Restoration to Jesus

- There is no writing prophets for about 400 years
- Prophecy of Daniel confirmed by secular records



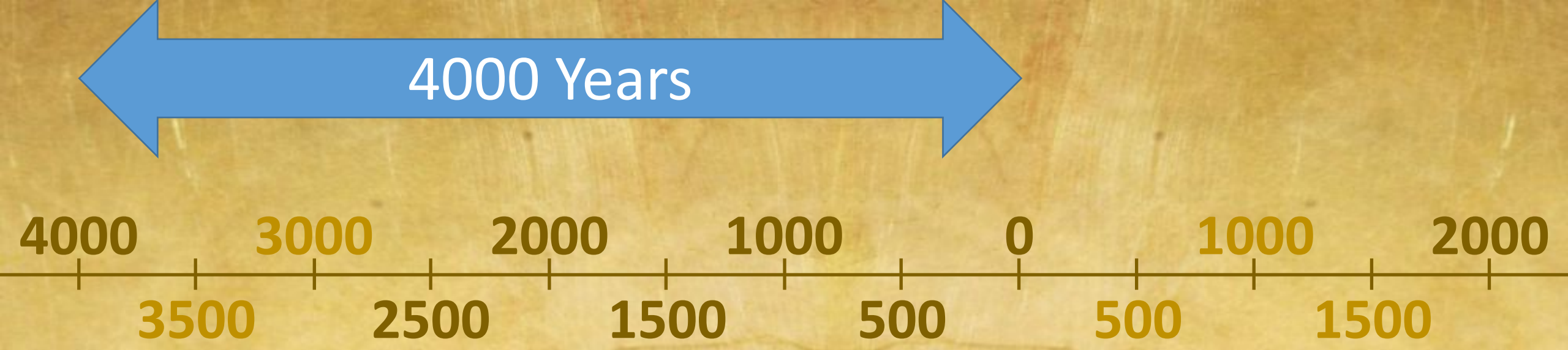
Restoration to Jesus

- There is no writing prophets for about 400 years
- Prophecy of Daniel confirmed by secular records

4000 Years

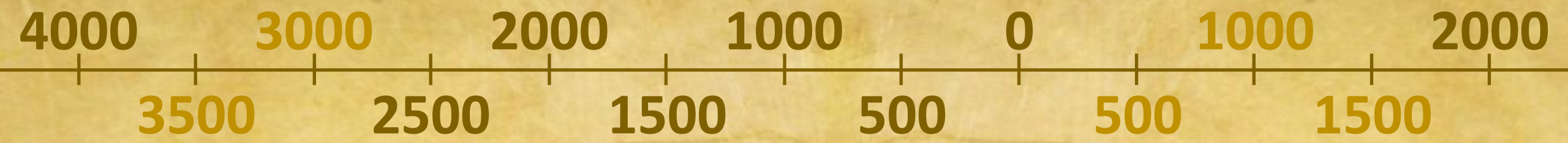
4000 3000 2000 1000 0 1000 2000

3500 2500 1500 500 500 1500



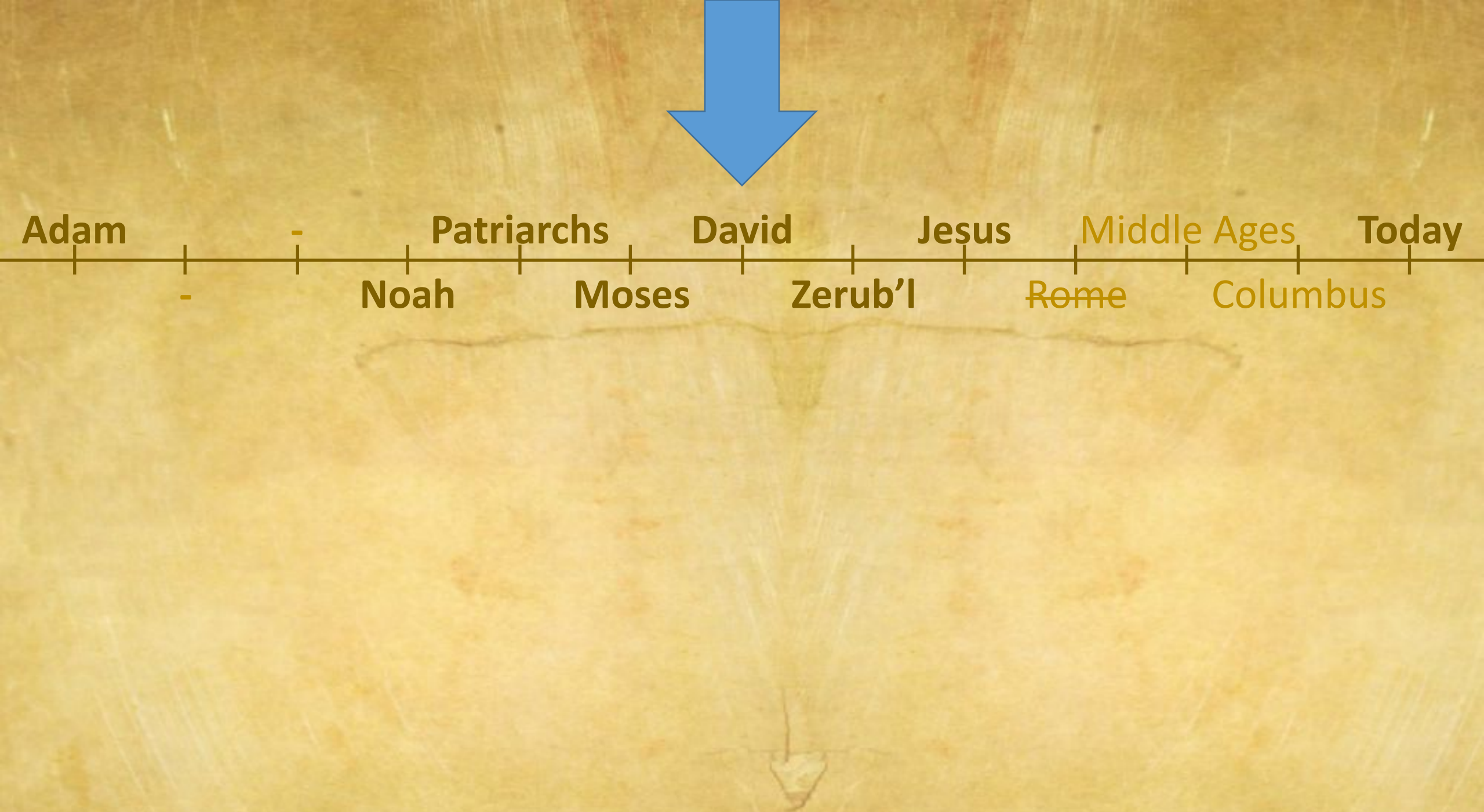
- 6 easy to remember steps…

0	Jesus
500	Restoration / Return from Captivity / Zerubabal
1000	David
1500	Moses
2000	Patriarchs
2500	Noah
4000	Adam


4000
3000
2000
1000
0
1000
2000
3500
2500
1500
500
500
1500

Adam - Patriarchs David Jesus Middle Ages Today

- Noah Moses Zerub'l ~~Rome~~ Columbus


Adam
-
Patriarchs
David
Jesus
Middle Ages
Today
-
Noah
Moses
Zerub'l
~~Rome~~
Columbus


Adam
-
Patriarchs
David
Jesus
Middle Ages
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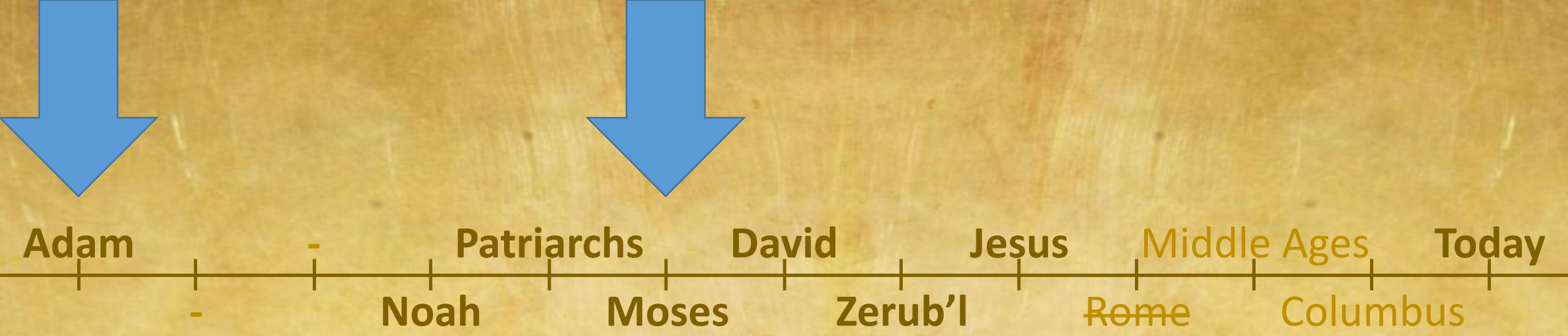
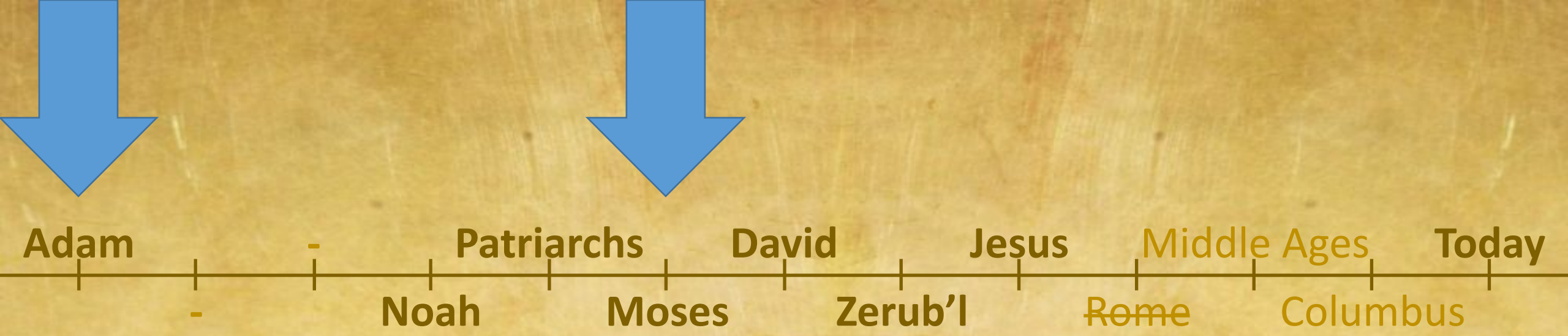
-
Noah
Moses
Zerub'l
~~Rome~~
Columbus



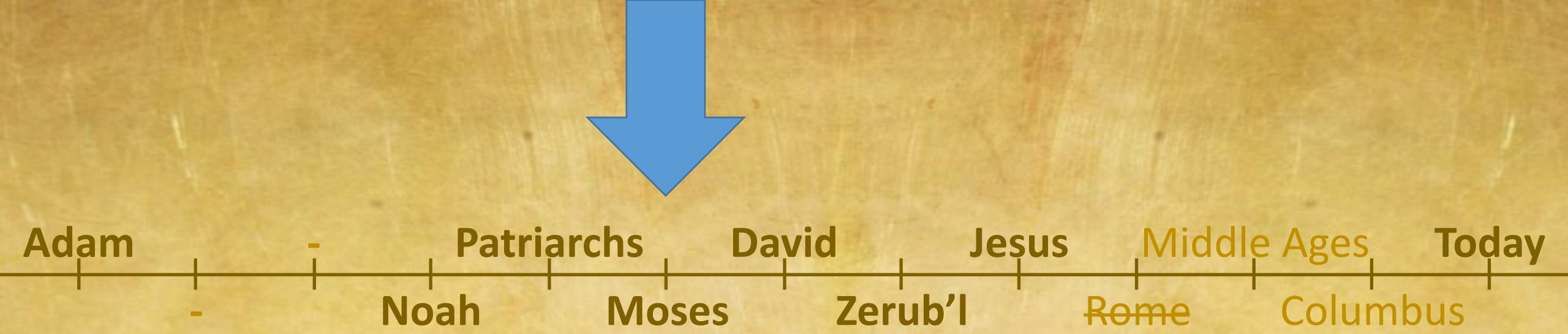
Creation to Moses

2500 years



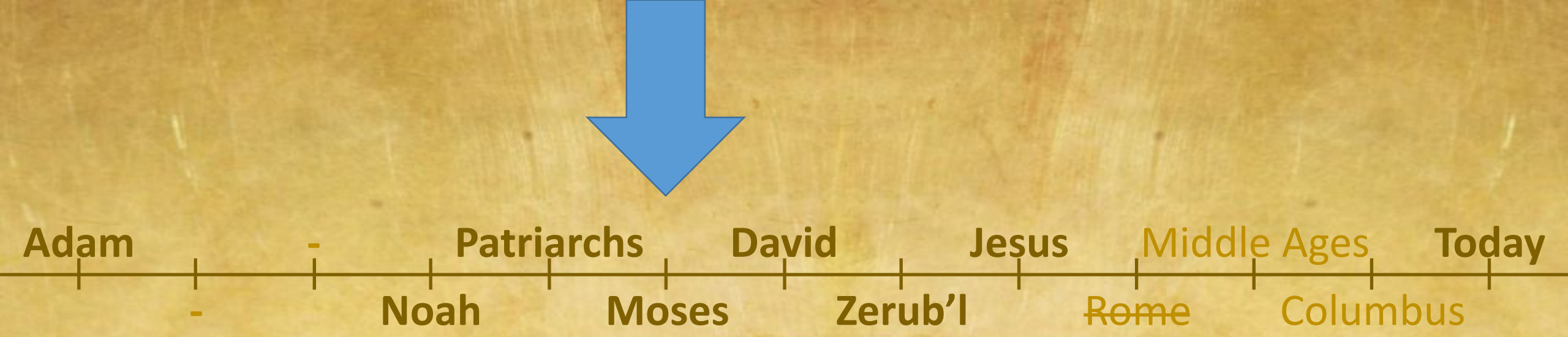
Creation to Moses

Genesis is a corrective Text!!!



6 Days of Creation

- Summary, Overview, Details
- Genesis 1:1-2 (Entire Overview)
- Genesis 1:3-31 (Daily Summary)
- Genesis 2:4f (Details of 6th Day)



3 Days Partitioning / 3 Days Populating

Day 1 – Light / Dark

Day 2 – Water / Air

Day 3 – Water / Land

+ Vegetation

Day 4 – Sun / Moon / Stars

Day 5 – Water / Air creatures

Day 6 – Land creatures

THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Most of these large concentrations are separated by vast sheets or sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic voids.

The great unifier of the cosmos is gravity. It holds the stars of a galaxy, and the galaxies of a cluster, together. But clusters, groups, and isolated individual galaxies are all flying away from each other in a continuing aftermath of the big bang, an explosion of spacetime that some scientists believe formed the universe 12 to 15 billion years ago.

1 SIZE OF THE UNIVERSE

So vast is space that not to scale even solar system structures have been left out. In the background image on this sheet we see a representative slice of the sky—roughly one ten-millionth of the diameter of the observable universe—yet even the smallest dots represent not stars or galaxies but whole conglomerations of galaxies, typically containing billions of stars.

EVOLUTION OF THE UNIVERSE

Ever since Edwin Hubble first observed that the galaxies of space were moving away from us, astronomers have theorized about the dynamics of the universe over the big bang to the present is known. From 1 billion that radiation and matter uncoupled—380,000 years after the big bang—gravity began creating order from the chaotic. From one billion years after the big bang, the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe unfolded.

2 OUR SUPERCLUSTER

Some 150 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters flood in our supercluster, and supports, believe a special matter would enter a nearly gaseous flow region called a cosmic void. Not like the regions within our supercluster is teeming with galaxies. Although the supercluster has a mean spacing some three and billion suns, virtually all its volume is empty. Empty, that is, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

Recent observations reveal that early in the universe's history galaxies collided and merged more often than they do now. That indicates that they were more numerous in the past and that many have grown larger over billions of years.

3 THE LOCAL GROUP

Galaxies streak in every direction beyond the Milky Way, but gravity keeps a family of some 28 galaxies, including our own, loosely bound.

The Local Group of galaxies extends some two million light-years across. Most galaxies in the group are considered dwarfs, but the two largest—our own Milky Way and the Andromeda galaxy—are giant spirals. Andromeda is at the center of a small subgroup which includes two elliptical galaxies, M32 and NGC 205, whose star formation has ceased. Even though it is more than two million light-years away from Earth, the Andromeda galaxy can be seen readily with the naked eye. With even a small telescope, its bright bulge is unmistakable.

It is possible that astronomers have not found some of our group's smaller galaxies, which may lie hidden behind dust clouds in the Milky Way.

All three main types of galaxies are represented in the Local Group: spirals, ellipticals, and irregulars. Nevertheless, the group has relatively few members, a hundredth that of some large galaxy clusters.

The galaxies of the Local Group are traveling together through space. Measurements show that the Milky Way is falling toward Andromeda. No collision is expected, however. Like race cars on opposite straightaways, the two are most likely at opposite ends of a highly elongated orbit around the group's center of mass.

4 OUR GALACTIC REALM

Until the early 20th century the known galaxies were the Milky Way galaxy was the entire universe. We now know that ours is only one of at least a hundred billion galaxies.

The Milky Way is a spiral galaxy, and our solar system is located in what is called the spiral's Orion arm, about 25,000 light-years from the center. Our own galaxy is a galactic system about once every 225 million years and has made the circuit about 20 times. In the spiral arms, new stars form as dense clouds of gas and dust condense. The stars' energy makes nearby parts of the clouds glow, causing them to glow.

The central bulge of the galaxy glows with the light of older, redder stars. More ancient stars, orbiting the galaxy in a diffuse halo, formed more than ten billion years ago. Several satellite galaxies, closer to orbit the Milky Way. Two of them, the Large and the Small Magellanic Clouds, are visible on Earth only from the Southern Hemisphere. The closest galaxy is a small spheroid called the Sagittarius Dwarf.

5 OUR SUN'S NEIGHBORHOOD

The stars reaching 30 light-years in all directions from our sun's make up the solar neighborhood. Each light-year measures 5.9 trillion miles, yet the neighborhood is a tiny part of the Milky Way. Most of the stars shown here are too dim to be seen with the naked eye, but a few, such as Sirius and Procyon—greatly exaggerated here and each actually two stars—are beacons in the sky.

In cosmic terms the sun is an ordinary yellow star, average in size and temperature. The brightest stars glow blue, the coolest white and.

Many stars are binary or multiple. Our nearest neighbor is the Alpha Centauri triple system. 4.3 light-years away. Closest of the three is Proxima Centauri (Alpha Centauri C), a red dwarf with 1/10 the mass and 1/13,000 the brightness of the sun's.

In recent years astronomers have discovered evidence of planets, similar to Jupiter in mass, orbiting stars. The nearest example is 51 Peg.

6 OUR SOLAR SYSTEM

A tiny dot on the scale of the universe, the solar system—our home in the galaxy—measures some 44 billion miles from the sun to the farthest source of Pluto's orbit. So might reaches Earth in about 8 minutes, and Jupiter in 43 minutes, but it takes nearly 7 hours to pass the orbit of Pluto.

Beyond Neptune are icy bodies smaller than planets. Three are Kuiper belt objects, over a hundred of which have been observed by telescope. Some scientists suggest that Pluto is a Kuiper belt object, rather than a planet. Spread in a great sphere around the entire solar system is the Oort cloud, billions of comets, a few of which make spectacular visits to the sun.

THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Allied clusters, large concentrations, are connected by filaments or sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic voids.

The great unifier of the cosmos is gravity. It holds the stars of a galaxy and the galaxies of a cluster together. But clusters, groups, and isolated individual galaxies are all flying away from each other, a continuing aftermath of the big bang, an explosion of space-time that astronomers believe formed the universe 12 to 15 billion years ago.

1 SIZE OF THE UNIVERSE

So vast is space that we begin to feel our solar system and our stars lose basis for scale. In the background image on this sheet we see a representative slice of the skyâ€”roughly one ten-millionth part of the diameter of the observable universe. Each dot represents not stars or galaxies but huge conglomerations of galaxies, ghostly agglomerations of dark matter, and gravitationally bent light rendered in the image, which is based on a supercomputer simulation. While the other tiers are incomplete, regions measured using the Anglo-Australian Telescope and other instruments are shown in true positions on the celestial sphere.

EVOLUTION OF THE UNIVERSE

Ever so long ago in an [illegible] universe of days gone by, [illegible] decades, scientists have debated about the structure of the universe. Was the big bang the present is basis. From [illegible] first stars [illegible] and matter accepted—[illegible] after the big bang—gravity began to [illegible] other [illegible] stars. Then, [illegible] billion years later the first galaxies formed. As clusters of galaxies accumulated, the filament and void structure of today's universe unfolded.

2 OUR SUPERCLUSTER

Some 150 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know carries [illegible] gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters float in our supercluster, [illegible] supports] before a special sooner would] enter a mostly gaseous flow region called a cosmic void. Not that the regions within our super- cluster is teeming with galaxies. Although the supercluster has a mass equaling some [illegible] billion suns, virtually all its vol- ume is empty. Empty. But it's, except for a [illegible] density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

Recent observations reveal that early in the universe's history galaxies collided and merged more often than they do now. That indicates that they were more numerous in the past and that many have grown larger over billions of years.

3 THE LOCAL GROUP

Galaxies stretch in every direction [illegible] the Milky Way, but gravity keeps a family of some 30 galaxies, including our own, loosely bound.

The Local Group of galaxies extends some two million light-years across. Most galaxies in the group are considerably smaller, but the two largest—our own Milky Way and the Andromeda galaxy—are giant spirals. Andromeda is at the center of a court subgroup; a whole [illegible] two elliptical galaxies, M32 and NGC 205, [illegible] star formation has ceased. Even though it is more than two million light-years away from Earth, the Andromeda galaxy can be seen readily with the naked eye. With even a small telescope, its bright bulge is [illegible].

It is possible that astronomers have not found some of our group's smaller galaxies, which may be hidden behind dust clouds in the Milky Way.

All three main types of galaxies are represented in the Local Group: spirals, elliptical, and irregulars. Nevertheless, the group has relatively few members, a hundredth that of some large galaxy clusters.

The galaxies of the Local Group are traveling together through space. Measurements show that the Milky Way is falling toward Andromeda. No collision is expected, however. Like race cars on opposite straightaways, the two are most likely at opposite ends of a highly elongated orbit around the group's center of mass.

4 OUR GALACTIC REALM

Until the early 20th century the [illegible] astronomers was that the Milky Way galaxy was the entire universe. We now know that ours is only one of at least a hundred billion galaxies.

The Milky Way is a spiral galaxy, and our solar system is located in what is called the spiral's Orion arm, about 26,000 light-years from the center. Our sun orbits the galactic center about once every 225 million years and has made the circuit about 20 times. In the spiral arms, new stars form as clouds of gas and dust condense. The stars' energy makes nearby parts of the clouds, causing them to glow.

The central bulge of the galaxy glows with the light of older, red- dish stars. More ancient stars, orbiting the galaxy in a diffuse halo, formed more than ten bil- lion years ago. Several satellite galaxies, closer [illegible] the Milky Way. Two of them, the Large and the Small Magellanic Clouds, are visible on Earth only from the Southern Hemisphere. The closest galaxy is a tiny spheroid called the Sagittarius Dwarf.

5 OUR SUN'S NEIGHBORHOOD

The stars reaching 20 light-years in all directions from our sun make up the solar neighbor- hood. Each light-year measures 5.9 trillion miles, yet the neigh- borhood [illegible] a tiny part of the Milky Way. Most of the stars shown here are too dim to be seen with the naked eye, but a few, such as Sirius and Pro- cyon—greatly exaggerated here and each actually two stars—are beacons in the sky.

In essence [illegible] the sun is an ordinary yellow star, average in size and temperature. The hy- drogen core glows blue, the cooler shell red.

Many stars are binary or even triple. Our nearest neighbor is the Alpha Centauri triple system, 4.3 light-years away. Closest of the three is Proxima Centauri (Alpha Centauri C), a red dwarf with 1/10 the mass and 1/13,000 the brightness of the sun.

In recent years astronomers have discovered evidence of planets, similar to Jupiter in mass, orbiting stars. The closest example is [illegible].

6 OUR SOLAR SYSTEM

A tiny dot on the scale of the universe, the solar system—our home in the galaxy—measures some 4.6 billion miles from the sun to the farthest [illegible] of Pluto's orbit. Its [illegible] reaches Earth in about 8 minutes and Jupiter in 43 minutes, but it takes nearly 7 hours to pass the orbit of Pluto.

Beyond Neptune are [illegible] smaller than planets. There are [illegible] Kuiper belt objects, over a hundred of which have been observed by telescope. Some scientists suggest that Pluto is a Kuiper belt object, rather than a planet. Spread in a great sphere around the [illegible] system is the Oort cloud, billions of comets, a few of which make spectacular visits to the sun.

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NATIONAL GEOGRAPHIC

EVOLUTION OF THE UNIVERSE

1 SIZE OF THE UNIVERSE

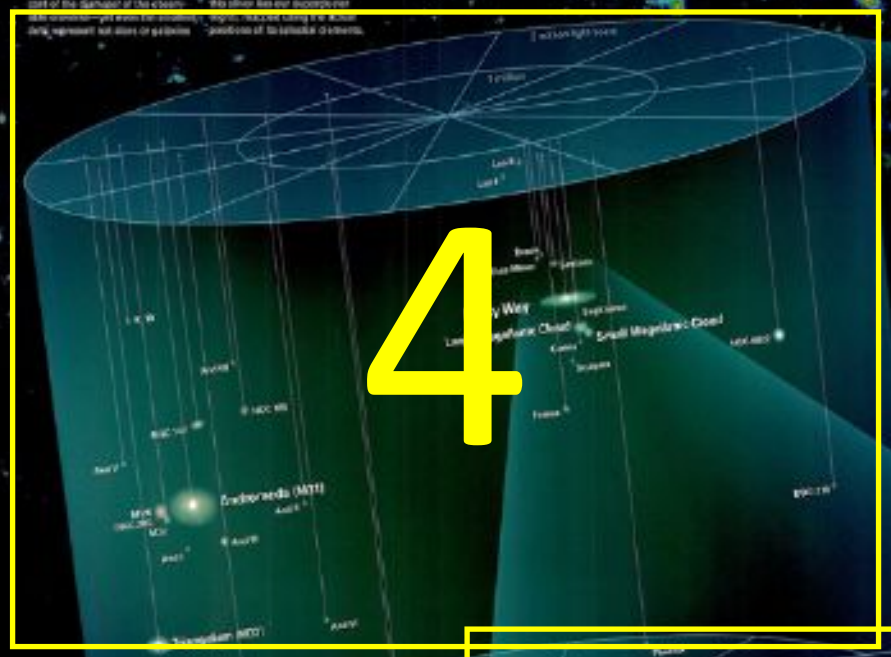
2 OUR SUPERCLUSTER

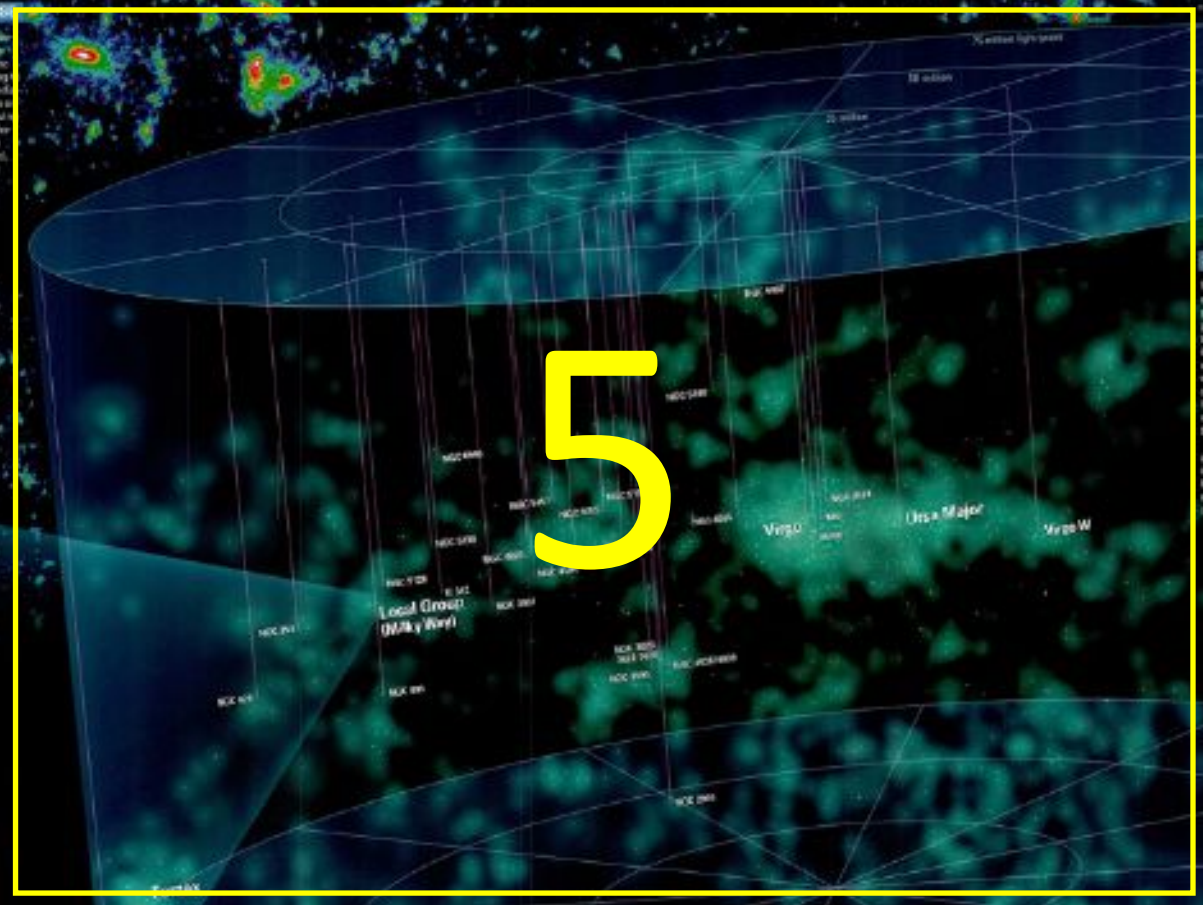
3 THE LOCAL GROUP

4 OUR GALACTIC REALM

5 OUR SUN'S NEIGHBORHOOD

6 OUR SOLAR SYSTEM





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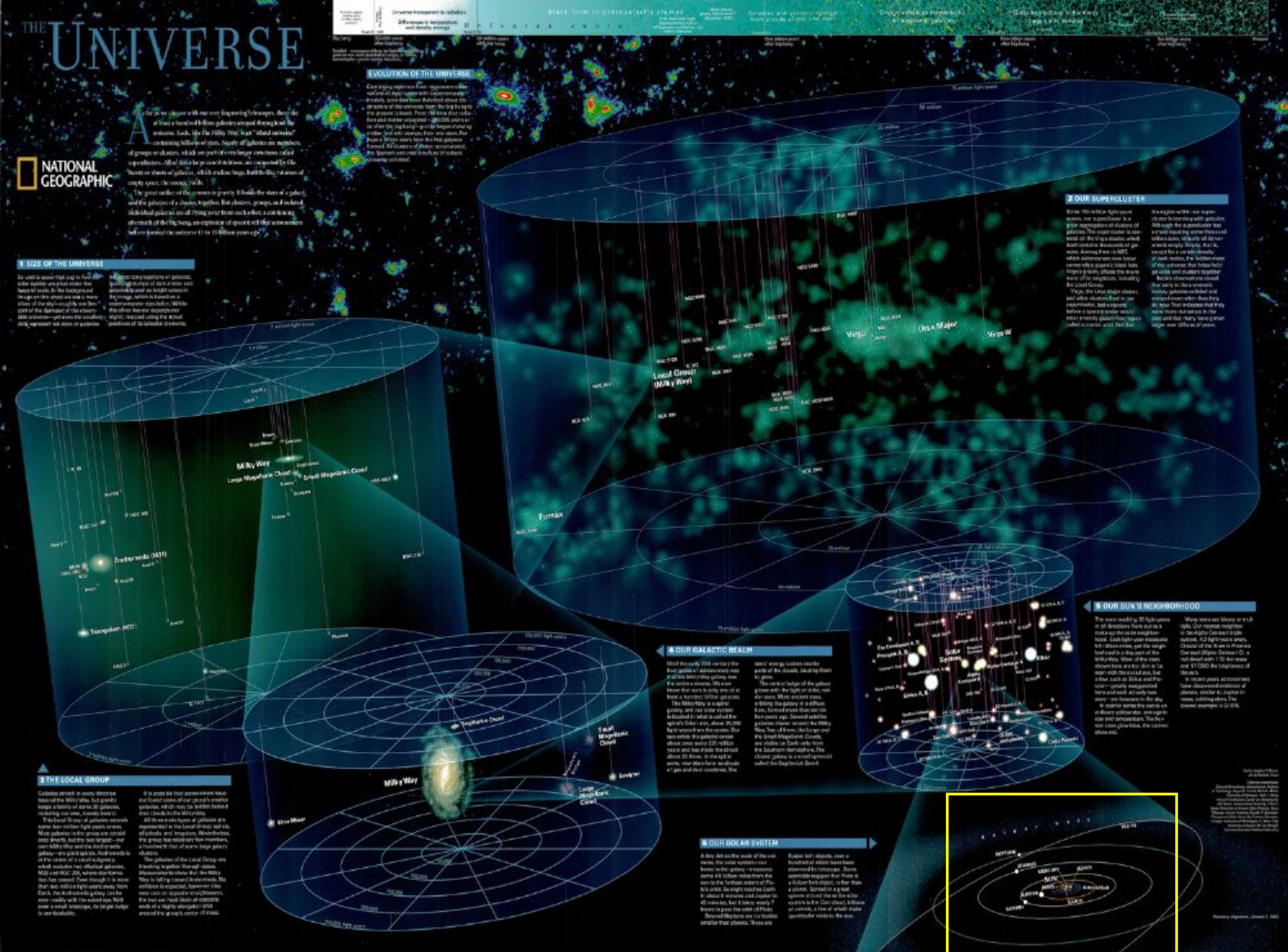
EVOLUTION OF THE UNIVERSE

Ever since astronomer Edwin Hubble discovered in the 1920s that the universe is expanding, scientists have debated about the structure of the universe near the big bang and the present is known. From 380,000 years after the big bang—a period of cooling and condensation—gravity began shaping matter into the first galaxies. Over the next billion years, the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe emerged.



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Virgo, the Ursa Major clusters, and other clusters flood in our supercluster, and supports believe a special matter would enter a newly glazed flow region called a cosmic void. Not that the region within our supercluster is teeming with galaxies. Although the supercluster has a mass equaling some three quadrillion suns, virtually all its volume is empty. Empty, that is, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

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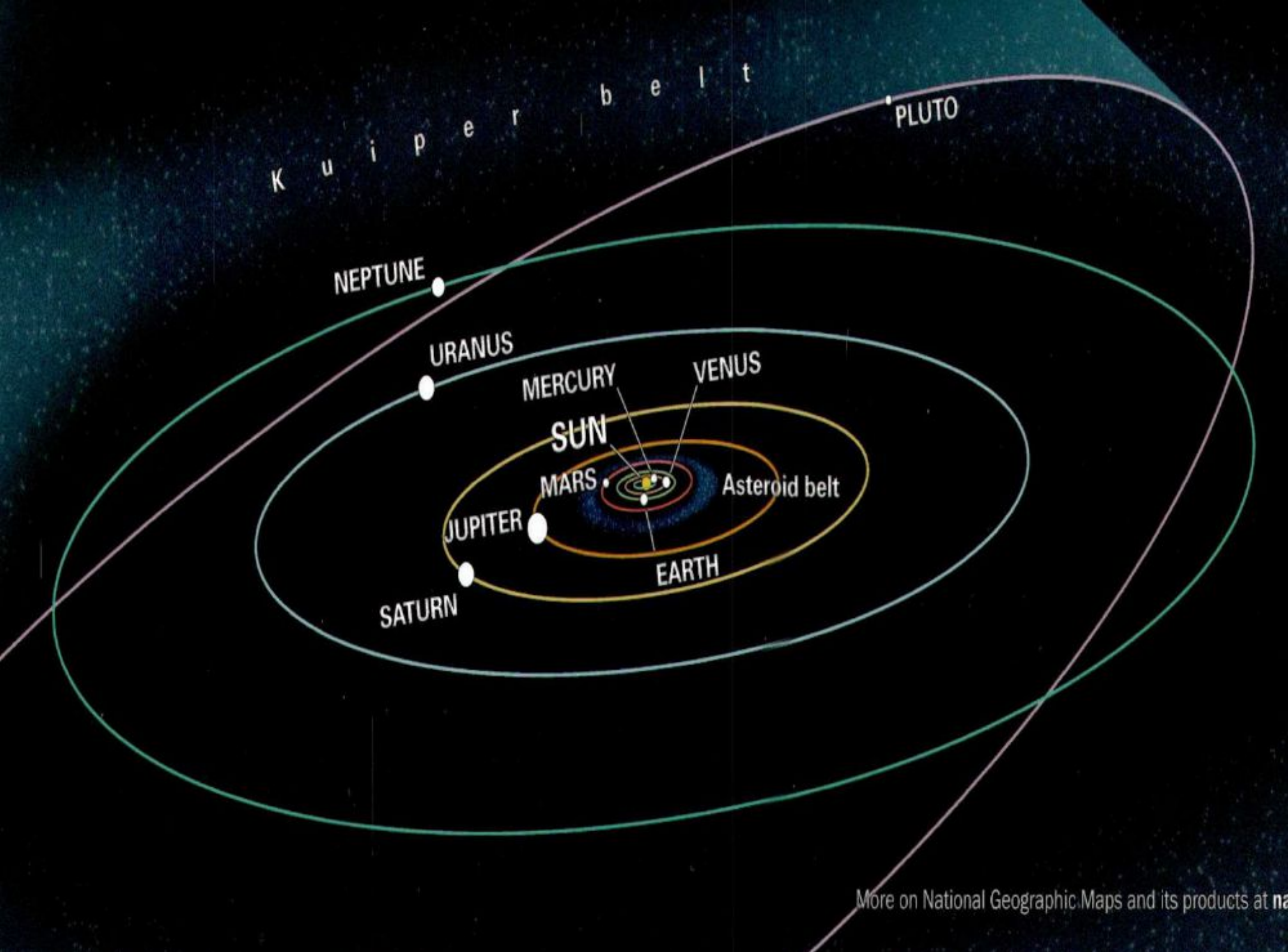

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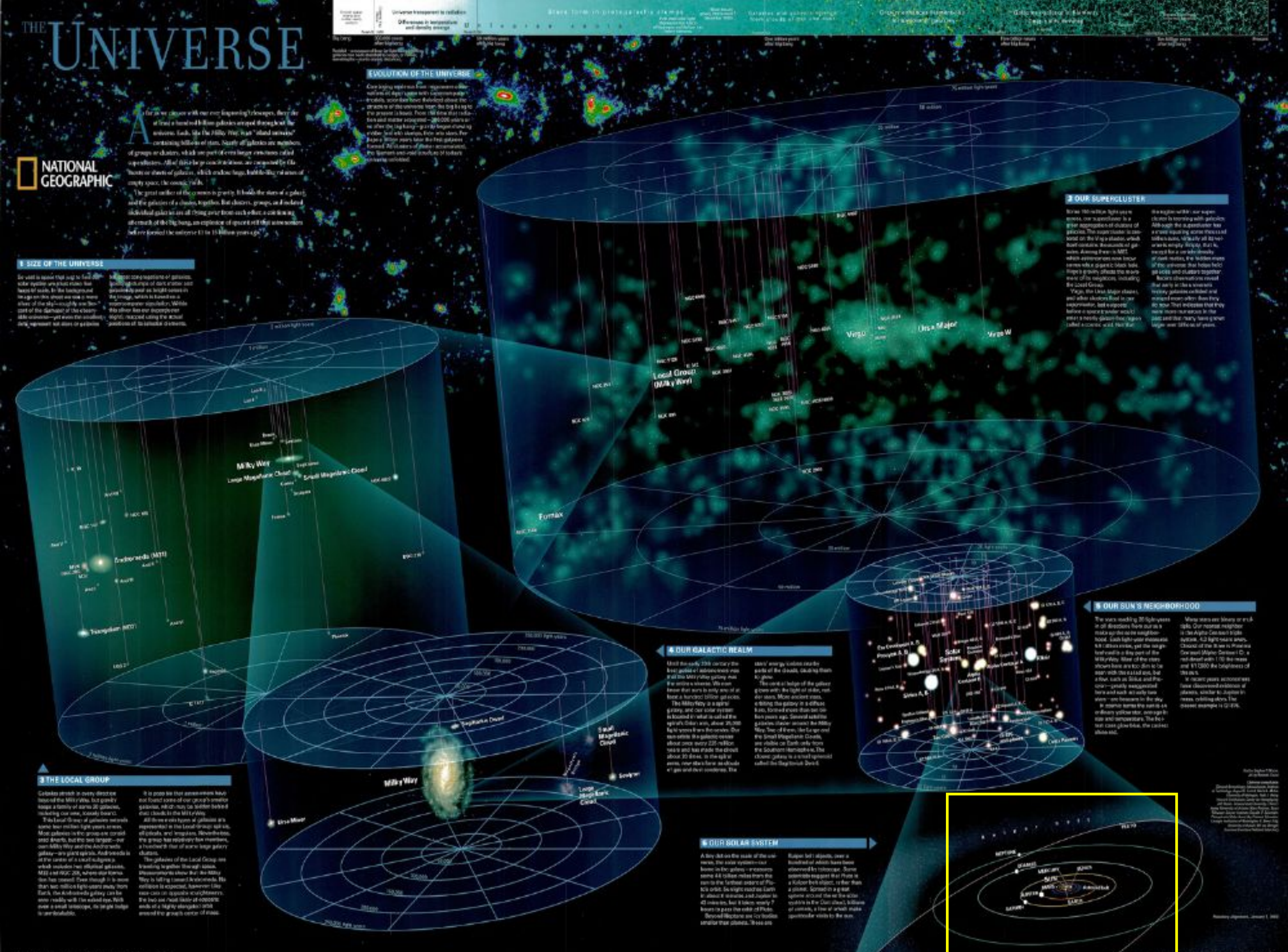

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1 SIZE OF THE UNIVERSE

So vast is space that we've had to build scale models of the solar system and the galaxy to get a sense of our place in the cosmos. But even these models can't help us grasp the size of the universe—yet even the smallest detail in the image on this sheet represents one billion light-years. Each of the billions of galaxies pictured here contains billions of stars, and between the galaxies lies the unimaginable void of intergalactic space.

2 OUR SUPERCLUSTER

Some 100 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

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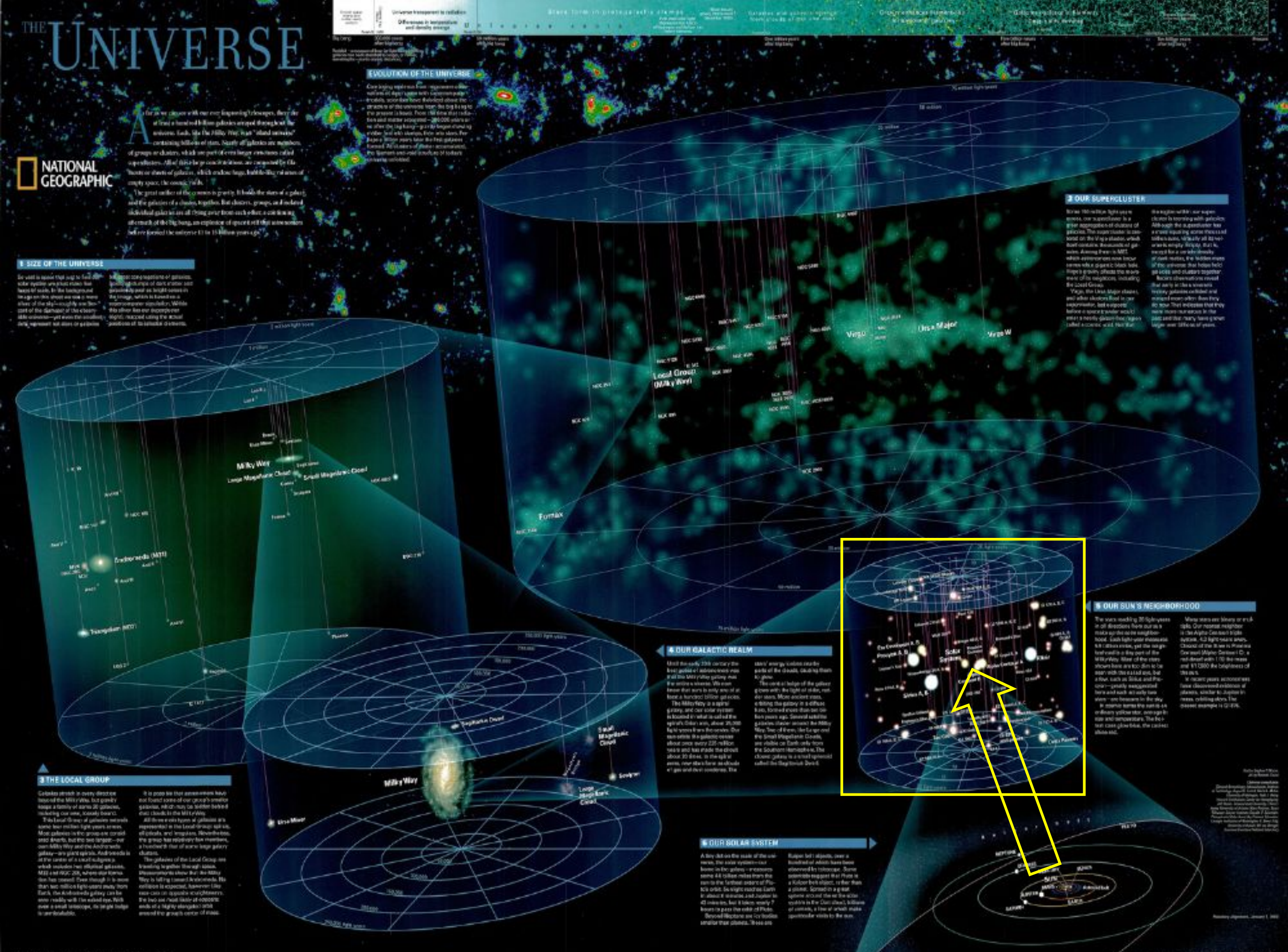
So vast is space that we're still discovering new objects even in our own solar system. Astronomers have been looking at the background image on this sheet for more than a century. Only a small portion of the sky—roughly one ten-millionth of the diameter of the observable universe—is shown here. Even the smallest dots, representing not stars or galaxies but whole conglomerations of galaxies, contain hundreds of billions of stars. And scientific instruments have revealed that the universe is filled with mysterious dark matter and energy that we can't see at all.

EVOLUTION OF THE UNIVERSE

Ever since Edwin Hubble first observed in the 1920s that the universe is expanding, astronomers have worked backward in time to learn about the origins of the universe. Now, the big bang theory, the present is based. From 380,000 years after the big bang—a time when stars and galaxies had not yet formed—scientists have been able to see the universe as it was then. Before that, they can only theorize about what happened. Some 200 million years after the big bang, the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe developed.



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4 OUR GALACTIC REALM

Until the early 20th century the known galaxies were only the Milky Way galaxy. We now know that ours is only one of at least a hundred billion galaxies.

The Milky Way is a spiral galaxy, and our solar system is located in what is called the spiral's Orion arm, about 25,000 light-years from the center. Our own galaxy is a galactic system about once every 225 million years and has made the circuit about 20 times. In the spiral arms, new stars form as clouds of gas and dust condense. The stars' energy makes nearby parts of the clouds glow, causing them to glow.

The central bulge of the galaxy glows with the light of older, redder stars. More ancient stars, orbiting the galaxy in a diffuse halo, formed more than ten billion years ago. Several satellite galaxies, closer to the Milky Way, two of them, the Large and the Small Magellanic Clouds, are visible in the Southern Hemisphere. The closest galaxy is a small spheroid called the Sagittarius Dwarf.

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The stars residing 30 light-years in all directions from our sun's make up the solar neighborhood. Each light-year measures 9.8 trillion miles, yet the neighborhood is a tiny part of the Milky Way. Most of the stars shown here are too dim to be seen with the naked eye, but a few, such as Sirius and Procyon—greatly exaggerated here and each actually two stars—are beacons in the sky.

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20 light-years
15
10
5
Lalande 21258
WX Ursae Majoris
Groombridge 1618
Wolf 424 A, B
AD Leonis
Gl 687
Gl 570 A, B, C
Ross 128
Gl 702 A, B
Lalande 21185
GJ 1245 A, B, C
Gl 628
Gl 663 A, B,
Gl 664
Wolf 359
Barnard's Star
Kruger 60 A, B
Eta Cassiopeia A, B
Procyon A, B
Solar System
Proxima Centauri
61 Cygni A, B
Altair
Luyten's Star
Alpha Centauri A
Groombridge 34 A, B
Ross 154
Alpha Centauri B
Gl 674
Ross 614 A, B
Sirius A, B
LHS 288
Gl 440
EZ Aquarii A, B, C
Epsilon Eridani
UV Ceti
Gl 65 A
AX Microscopium
Kapteyn's Star
Lacaille 9352
Epsilon Indi
Ross 248
Gl 783 A, B
Gl 1061
YZ Ceti
Gl 876
and planet
Gl 166 A, B, C
Tau Ceti
GJ 1002
Delta Pavonis
Gl 1
LP 944-20
5
10
15
20 light-years

THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Most of these large concentrations are separated by vast sheets or sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic voids.

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So vast is space that we've had to find other scales by which to measure it. In the background image on this sheet we use a metric sphere of the sky—roughly one billionth part of the diameter of the observable universe—yet even the smallest dots represent not stars or galaxies but whole conglomerations of galaxies, ranging up to groups of dark matter and gravitationally pear as bright centers in the image, which is based on a supercomputer simulation. While the other five-star incomplete (or slightly), mapped using the actual positions of the nearest galaxies.

EVOLUTION OF THE UNIVERSE

Ever-larging explosion from expansion of the universe of days' space-time expansion, scientists have theorized about the structure of the universe over the big bang to the present is based. From the first few stars radiation and matter ecosystem—200,000 years or so after the big bang—gravity began drawing matter into galaxies. From one stars. Five billion years later the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe unfolded.

2 OUR SUPERCLUSTER

Some 150 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters flood in our supercluster, and supports believe a special matter would enter a nearly gluelike flow region called a cosmic void. Not like the regions within our supercluster is teeming with galaxies. Although the supercluster has a crown spanning some three and billion suns, virtually all its volume is empty. Empty. But it's, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

Recent observations reveal that early in the universe's history galaxies collided and merged more often than they do now. That indicates that they were more numerous in the past and that many have grown larger over billions of years.

Virgo
Ursa Major
Virgo W
Local Group
(Milky Way)
Fornax

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Galaxies stretch in every direction beyond the Milky Way, but gravity keeps a family of some 28 galaxies, including our own, loosely bound.

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Andromeda (M31)
Triangulum (M33)
Milky Way
Large Magellanic Cloud
Small Magellanic Cloud
Sculptor
Ursa Major

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Sagittarius Dwarf
Small Magellanic Cloud
Sculptor
Large Magellanic Cloud
Ursa Major

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Solar System
Alpha Centauri A, B
Sirius A, B
Procyon A, B
Epsilon Eridani
61 Cygni A, B
Groombridge 34 A, B
Lalande 21185
Luyten 726-8 A, B
Ross 154
Ross 248
Epsilon Indi
Tau Ceti
Luyten's Star
Wolf 359
BD +36°2147
Van Maanen's Star
Wolf 424 A, B
Gliese 725 A, B
Gliese 570 A, B
Kapteyn's Star
Kruger 60 A, B
Ross 614 A, B
Wolf 1061
Gliese 628
Gliese 644 A, B
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Gliese 702 A, B
Gliese 713
Gliese 720 A, B
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PLUTO
NEPTUNE
URANUS
SATURN
JUPITER
MARS
EARTH
VENUS
MERCURY
SUN

THE UNIVERSE

NATIONAL GEOGRAPHIC

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1 SIZE OF THE UNIVERSE

So vast is space that we're still discovering new planets even in our own solar system. Astronomers have been looking for years for a tenth planet, which they've named Planet X. Some think it may be a large, cold, dark object in the Kuiper belt, a region of comets and asteroids beyond the orbit of Neptune. Others believe it may be a small, dim star in the Oort cloud, a vast spherical shell of comets that surrounds the solar system at a distance of about a light-year. Still others think Planet X may not exist at all.

Astronomers have also found many planets around other stars. Most of these are huge gas giants, like Jupiter, but some are smaller, rocky worlds like Earth. Scientists are searching for signs of life on these planets, such as the presence of oxygen or water vapor in their atmospheres.

The search for life beyond Earth is one of the most exciting frontiers in science today. With new telescopes and spacecraft being launched, we may soon learn whether we are alone in the universe or not.

EVOLUTION OF THE UNIVERSE

Ever since the 1920s, when Edwin Hubble discovered that the universe is expanding, astronomers have been trying to work out the history of the universe. They call it the big bang theory. According to this theory, the universe began as a tiny, hot, dense point about 13 billion years ago. It has been expanding and cooling ever since.

The first few minutes after the big bang were very important. During this time, the universe was filled with a hot, dense soup of subatomic particles. As the universe expanded and cooled, these particles combined to form the first atoms, mostly hydrogen and helium.

About 300,000 years after the big bang, the universe had cooled enough for these atoms to form. This is called the era of recombination. Before this, the universe was filled with a hot, glowing fog of charged particles. After this, the universe became transparent to light, and the first stars and galaxies began to form.

Over billions of years, gravity has pulled matter together to form the galaxies, stars, and planets we see today. The universe is still expanding, and the rate of expansion is increasing. This is thought to be due to a mysterious force called dark energy.

2 OUR SUPERCLUSTER

Some 100 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

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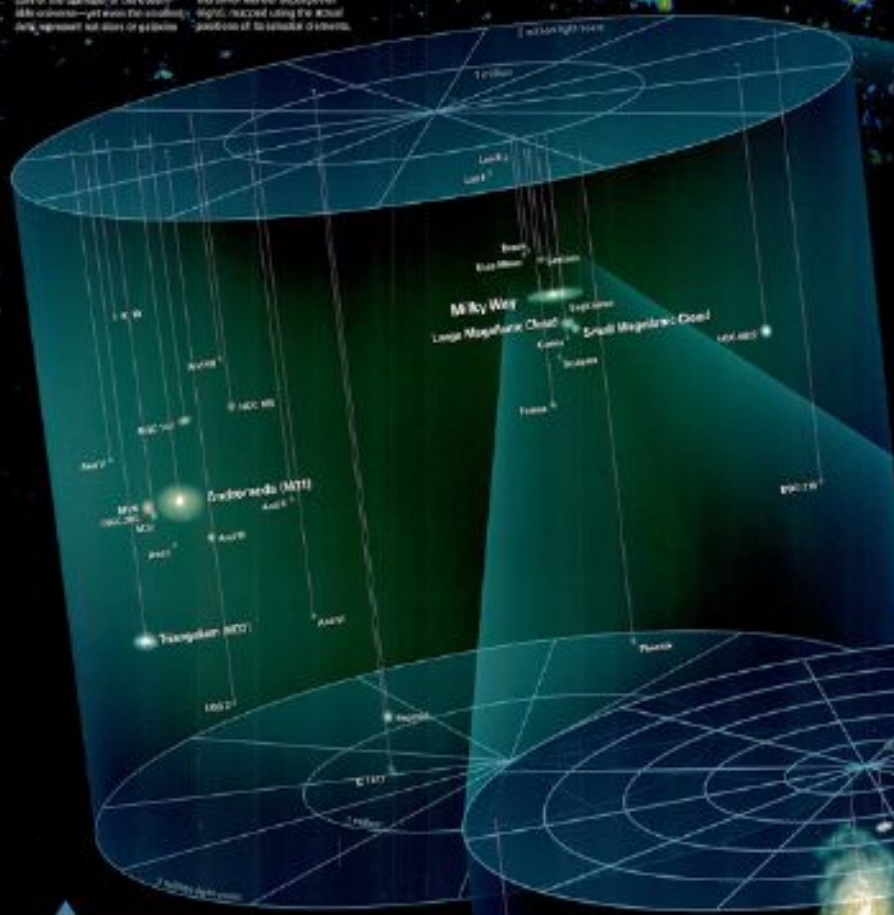

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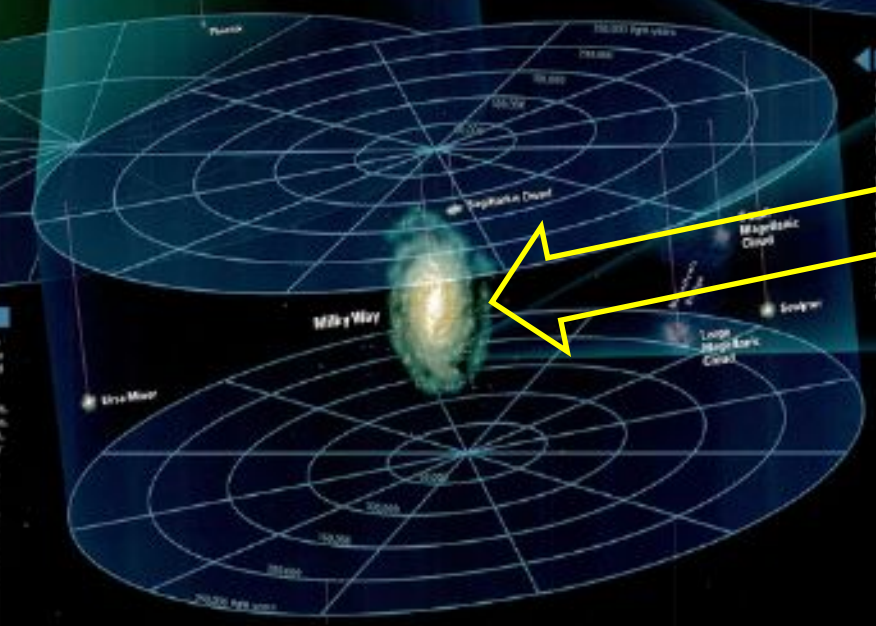

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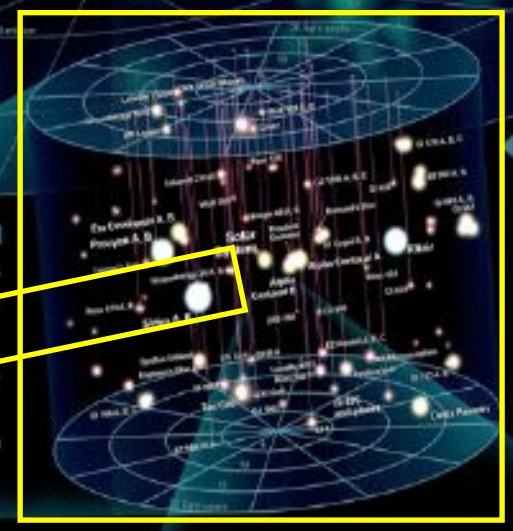

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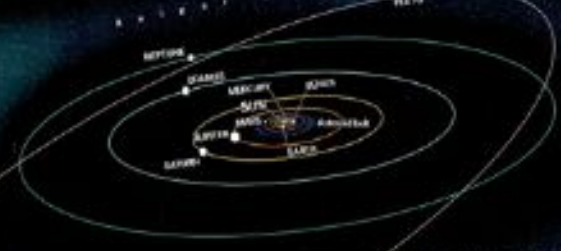

THE UNIVERSE

NATIONAL GEOGRAPHIC

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EVOLUTION OF THE UNIVERSE

Ever so long ago in an East Coast basement, a physicist named George Gamow and two colleagues, Ralph Alpher and Robert Herman, published a paper that would have startled almost the greatest of the universe's many surprises. The big bang, he argued, had left behind a faint radiation that could be detected even billions of years later. Gamow's paper, published in 1948, described the universe as a hot, dense fireball that had been expanding and cooling for billions of years. Gamow's colleagues, Alpher and Herman, had calculated that the temperature of the radiation left over from the big bang should be about 5 degrees above absolute zero, or 5 degrees Kelvin (5 K).

Gamow's paper was largely ignored. Few astronomers believed that the universe had begun with a big bang, and no one had the technology to detect the faint radiation that Gamow predicted. It was not until 1965, when two scientists at Bell Telephone Laboratories in New Jersey, Arno Penzias and Robert Wilson, were trying to eliminate background noise from a microwave antenna they were using for radio astronomy that they discovered the radiation that Gamow had predicted. Penzias and Wilson had found the afterglow of the big bang.

Since then, astronomers have been able to look back in time to see the universe as it was billions of years ago. Using powerful telescopes, they have found that galaxies were closer together in the past than they are today. Quasars, which are now rare, were common in the early universe. Most galaxies were smaller and more irregular in shape than they are today. Many of the galaxies that we see today have grown by merging with smaller galaxies.

1 SIZE OF THE UNIVERSE

So vast is space that we begin to feel our solar system and our place in it have been of little importance. In the background image on this sheet we see a representative slice of the sky—roughly one ten-thousandth of the diameter of the observable universe—yet even the smallest dots, representing not stars or galaxies but huge conglomerations of galaxies, contain hundreds of billions of stars. Each of the galaxies in the image, which is based on a supercomputer simulation, is itself a vast collection of stars. While the other five panels on these pages show the universe as it is today, the image at the left, created using the latest calculations of the distribution of matter in the universe, shows the universe as it was 12 billion years ago.

2 OUR SUPERCLUSTER

Some 100 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters float in our supercluster, like a gigantic bubble in space. Astronomers believe a similar bubble would enter a nearly glassy-free region called a cosmic void. Not that the region within our supercluster is teeming with galaxies. Although the supercluster has a mass equaling some one hundred billion suns, virtually all its volume is empty. Empty, that is, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

Recent observations reveal that early in the universe's history galaxies collided and merged more often than they do now. That indicates that they were more numerous in the past and that many have grown larger over billions of years.

3 THE LOCAL GROUP

Galaxies streak in every direction beyond the Milky Way, but gravity keeps a family of some 28 galaxies, including our own, loosely bound.

The Local Group of galaxies extends some two million light-years across. Most galaxies in the group are considered dwarfs, but the two largest—our own Milky Way and the Andromeda galaxy—are giant spirals. Andromeda is at the center of a court subgroup, which includes two elliptical galaxies, M32 and NGC 205, whose star formation has ceased. Even though it is more than two million light-years away from Earth, the Andromeda galaxy can be seen readily with the naked eye. With even a small telescope, its bright bulge is unmistakable.

It is possible that astronomers have not found some of our group's smaller galaxies, which may lie hidden behind dust clouds in the Milky Way.

All three main types of galaxies are represented in the Local Group: spirals, ellipticals, and irregulars. Nevertheless, the group has relatively few members, a hundredth that of some large galaxy clusters.

The galaxies of the Local Group are traveling together through space. Measurements show that the Milky Way is falling toward Andromeda. No collision is expected, however. Like race cars on opposite straightaways, the two are most likely at opposite ends of a highly elongated orbit around the group's center of mass.

4 OUR GALACTIC REALM

Until the early 20th century the known galaxies were the Milky Way galaxy. Then, in 1924, Edwin Hubble, using the 100-inch telescope on Mount Wilson, discovered that the Andromeda nebula was a galaxy like our own. Hubble's discovery opened the universe to astronomers.

The Milky Way is a spiral galaxy, a flattened disk of stars and gas. Our solar system is located in what is called the Sagittarius arm, about 25,000 light-years from the center. Our sun orbits the galactic center at about 250 kilometers per second and has made the circuit about 20 times. In the spiral arms, new stars form as clouds of gas and dust condense. The stars' energy makes nearby parts of the clouds glow, causing them to glow.

The central bulge of the galaxy glows with the light of older, reddish stars. More ancient stars, orbiting the galaxy in a diffuse halo, formed more than ten billion years ago. Several smaller galaxies, called satellites of the Milky Way, are also part of it. Three of them, the Large and the Small Magellanic Clouds, are visible to Earth only from the Southern Hemisphere. The closest galaxy is a small spheroid called the Sagittarius Dwarf.

5 OUR SUN'S NEIGHBORHOOD

The stars residing 30 light-years in all directions from our sun's make up the solar neighborhood. Each light-year measures 9.5 trillion miles, yet the neighborhood is a tiny part of the Milky Way. Most of the stars shown here are too dim to be seen with the naked eye, but a few, such as Sirius and Procyon—greatly exaggerated here and each actually two stars—are treasures in the sky.

In cosmic terms the sun is an ordinary yellow star, average in size and temperature. The hottest stars glow blue, the coolest white-hot.

Many stars are binary or even triple. Our nearest neighbor is the Alpha Centauri triple system, 4.3 light-years away. Closest of the three is Proxima Centauri (Alpha Centauri C), a red dwarf with 1/10 the mass and 1/13,000 the brightness of the sun's.

In recent years astronomers have discovered evidence of planets, similar to Jupiter in mass, orbiting stars. The nearest example is 51 Peg.

6 OUR SOLAR SYSTEM

A tiny dot on the scale of the universe, the solar system—our home in the galaxy—measures some 44 billion miles from the sun to the farthest source of Pluto's orbit. Six eight reaches Earth in about 8 minutes and Jupiter in 43 minutes, but it takes nearly 7 hours to pass the orbit of Pluto.

Beyond Neptune are icy bodies smaller than planets. These are Kuiper belt objects, over a hundred of which have been observed by telescope. Some scientists suggest that Pluto is a Kuiper belt object, rather than a planet. Spread in a great sphere around the entire solar system is the Oort cloud, billions of comets, a few of which make spectacular visits to the sun.

Phoenix

250,000 light-years

200,000

150,000

100,000

50,000

Sagittarius Dwarf

Small Magellanic Cloud

Magellanic Bridge

Sculptor

Milky Way

Large Magellanic Cloud

Ursa Minor

50,000

100,000

150,000

200,000

250,000 light-years

Phoenix

250,000 light-years

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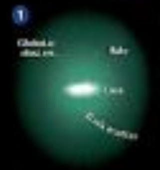
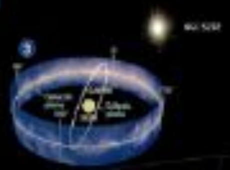
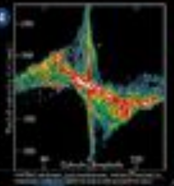
THE MILKY WAY

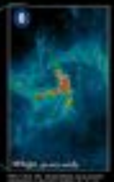
Home galaxy of Earth, the Milky Way is a spiral-shaped system of a few hundred billion stars. Bright regions of recently formed stars highlight its arms, while older stars explode or expel their outer layers as beautiful planetary nebulae, then fade away and die. A thick swarm of orange and red stars marks the galactic bulge, encapsulating the star-packed galactic center. At its core may lie a black hole, a region so dense that not even light can escape its gravitational pull. All objects in the Milky Way orbit the galactic center, much like planets in Earth's solar system revolve around the sun. But the scale is staggering: Light from a star at one edge of the galaxy takes about 100,000 years to reach the opposite side.



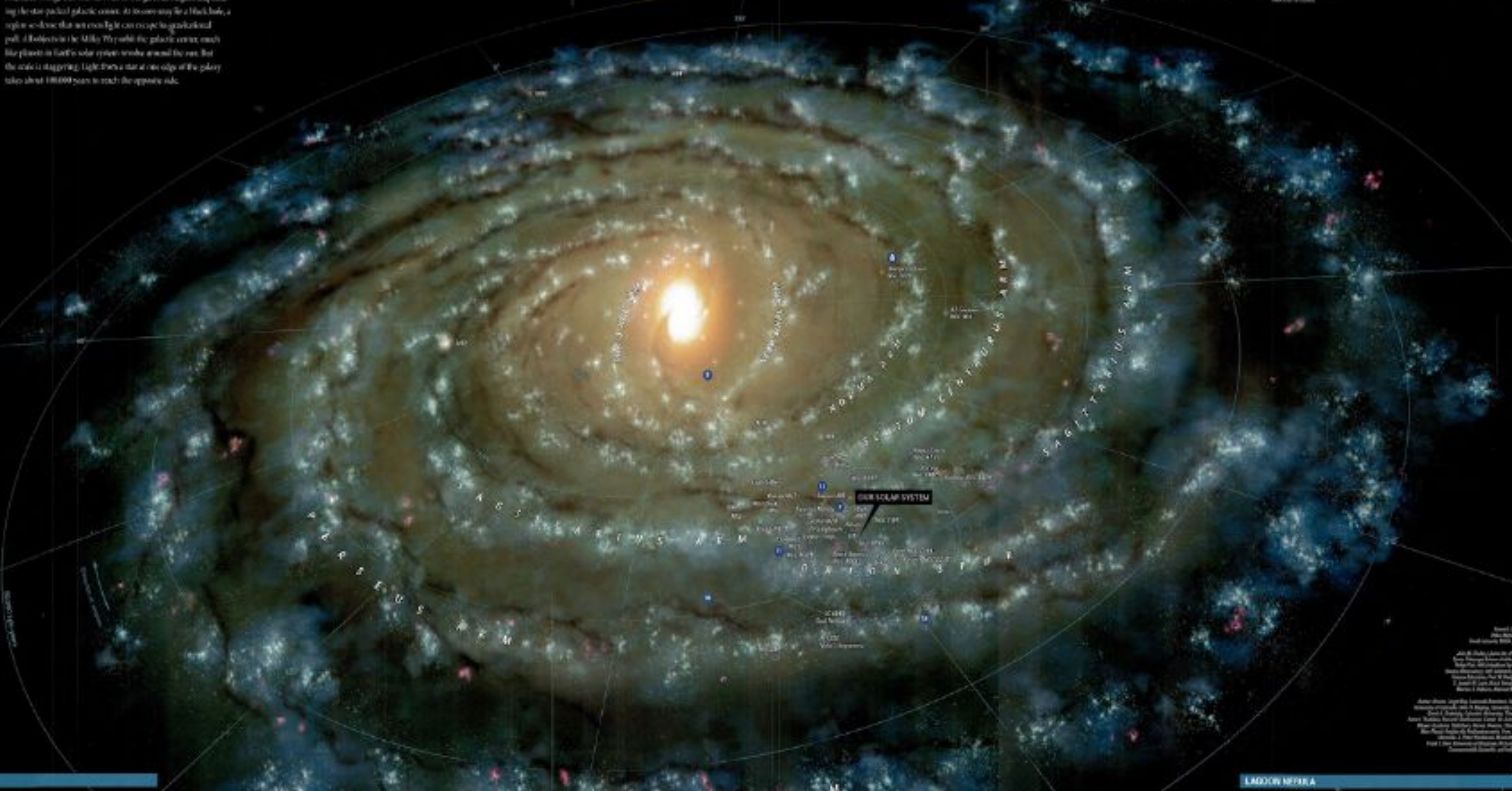
GUIDE TO THE GALAXY







A TURBULENT HEART



This computer-generated image of the Milky Way—one perspective of a 3-D model—approximates the actual positions of hundreds of thousands of stars and nebulae.

Reference numbers for galaxies, nebulae, and star clusters

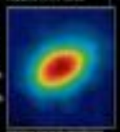
IC (Index Catalogue)

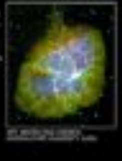
M (Messier Catalogue)

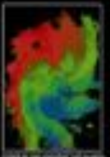
NGC (New General Catalogue)

TWIN JET NEBULA

LAGOON NEBULA







THE MILKY WAY

NATIONAL GEOGRAPHIC

Home galaxy of Earth, the Milky Way is a spiral-shaped system of a few hundred billion stars. Bright regions of recently formed stars highlight its arms, while older stars explode or expel the outer layers as beautiful planetary nebulae, then fade over millions of years. A thick swarm of orange and red stars marks the galactic bulge, encompassing the star-packed galactic center. At its core may lie a black hole, a region so dense that not even light can escape its gravitational pull. Orbiting the Milky Way's galactic center, much like planets in Earth's solar system revolve around the sun, are the stars' own families of planets. But the scale is staggering: Light from a star at one edge of the galaxy takes about 100,000 years to reach the opposite side.

GUIDE TO THE GALAXY

1 Far beyond the galactic disk, lost citizens by the gravity, lone stars and globular clusters roam the galaxy's halo. Regions of dark matter—unseen but felt through its gravitational effects—extend beyond that.

2 Vast clouds of interstellar dust block much of our sight into the Milky Way, which from our position in the flat galactic disk appears as a hazy band of light. Infrared satellites can see through the dust to reveal the galaxy's structure.

3 Earth's orbit around the sun lies at a severe angle to the galactic plane.

A TURBULENT HEART

4 A graph based on a radio survey reveals the whirlpool motion of interstellar gas on the inner part of our galaxy, gas moving away from Earth (top half) and toward Earth (bottom half). To demarcate opposite velocities, these shades, blue.

5 Massive streamers of energy are released near the center of the Milky Way, perplexing astronomers. Image is a composite of two views.

6 Gamma rays, a radio image reveals a spur of hot gas that is falling toward what may be a black hole—or as the latter is known as the sun.

This computer-generated image of the Milky Way—one perspective of a 3-D model compiled by Princeton, Columbia, and Harvard researchers—incorporates the latest positions of hundreds of thousands of stars and nebulae.

- Unbroken star clouds
- Interstellar gas and dust
- Nebula
- Younger star regions and stars
- Molecular cloud
- Galactic bulge or nucleus (older and lighter)

Reference numbers for galaxies, nebulae, and star clusters
- NGC/IC (Index Catalog)
- M (Messier Catalog)
- NGC (New General Catalog)

Celestial coordinate system: equatorial or galactic

TWIN JET NEBULA

LAGOON NEBULA

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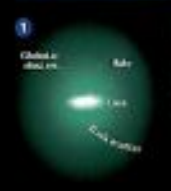
THE MILKY WAY

NATIONAL GEOGRAPHIC

Home galaxy of Earth, the Milky Way is a spiral-shaped system of a few hundred billion stars. Bright regions of recently formed stars highlight its arms, while older stars explode or expel the outer layers as beautiful planetary nebulae, then fade over millions of years. A thick swarm of orange and red stars marks the galactic bulge, encompassing the star-packed galactic center. At its core may lie a black hole, a region so dense that not even light can escape its gravitational pull. Astronomers believe the Milky Way's orbit the galactic center, much like planets in Earth's solar system revolve around the sun. But the scale is staggering: Light from a star at one edge of the galaxy takes about 100,000 years to reach the opposite side.



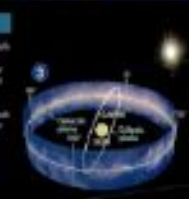
GUIDE TO THE GALAXY

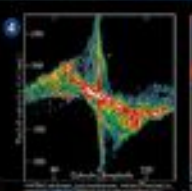
1 Far beyond the galactic disk, but drawn by the gravity, lone stars and globular clusters roam the galaxy's halo. Regions of dark matter—unseen but felt through its gravitational effects—extend beyond that.

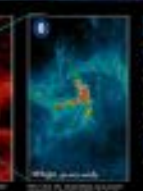
2 Vast clouds of interstellar dust block much of our sight line to the galactic center. They sparkle like an ornament of gems or a peacock's velvet tail in some dark clouds but average composite image (2008-M-120), observed by Chandra X-ray Observatory telescope in Chile and mapped in infrared light (Large Apex Bolometer Camera) and visible light (Digitized Sky Survey).

3 Our solar system orbits the galactic center, much like planets in Earth's solar system revolve around the sun. But the scale is staggering: Light from a star at one edge of the galaxy takes about 100,000 years to reach the opposite side.

4 Our sun, like billions of other stars in the galaxy, is not a solitary traveler. It is part of a group of stars that share a similar orbit around the galactic center.





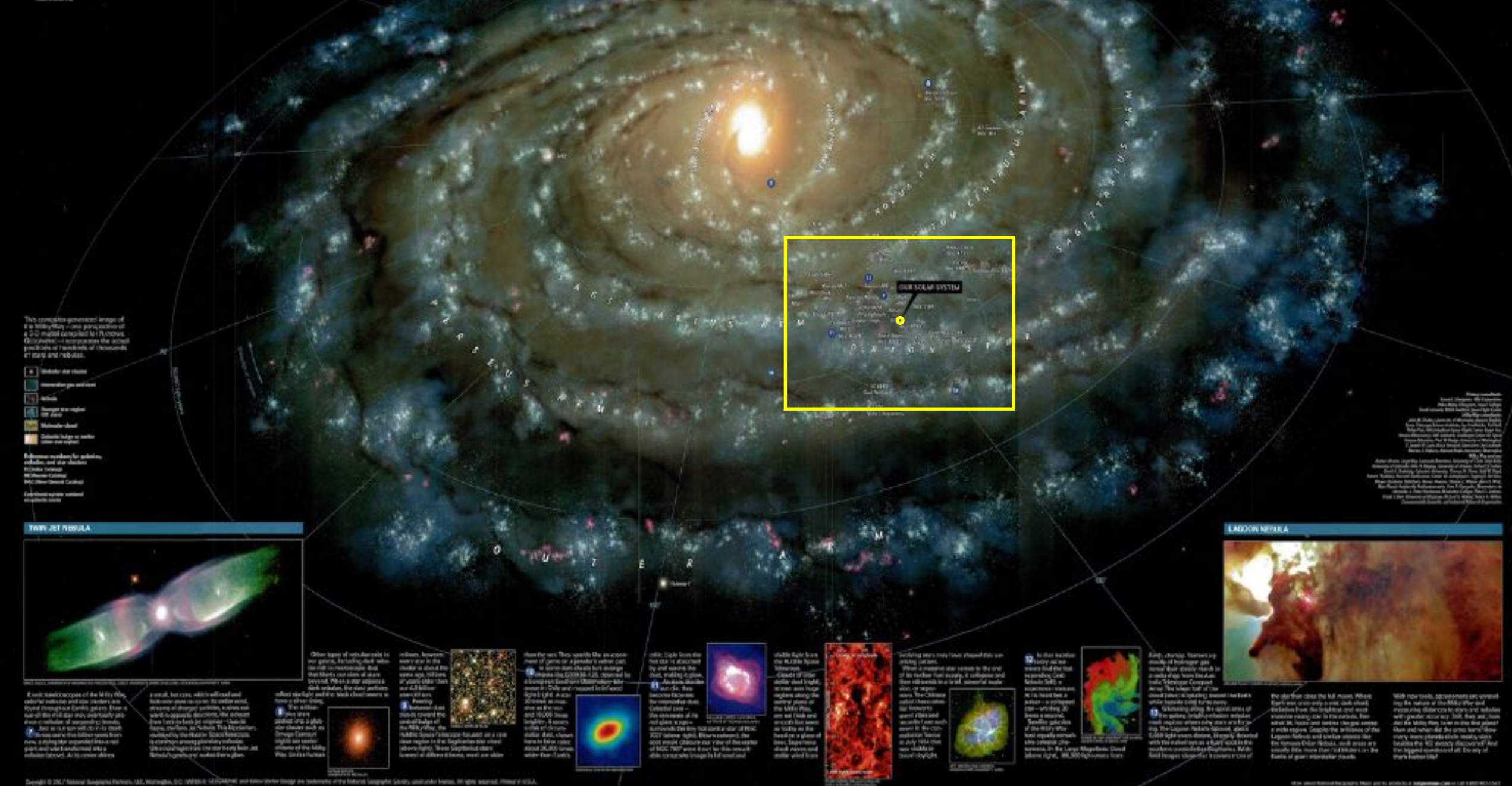


A TURBULENT HEART

4 A gigantic bubble in a radio nebula reveals the whirlpool motion of interstellar gas on the inner part of our galaxy, gas moving away from Earth (blue half) and toward Earth (bottom half). To demonstrate opposite velocities, below.

5 Massive streamers of energy are released near the center of the Milky Way, perplexing astronomers.

6 Hot, ionized gas—the stuff of the cloud (blue) is rotating around the black hole while narrow (red) forms away.



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TWIN JET NEBULA

A vast stellar cataclysm of the Milky Way, celestial nebulae and star clusters are found throughout Earth's galaxy. Even a star on the mid-star may experience profound evolution of secondary trends.

And so our sun will do in its death. Perhaps some five billion years from now, a dying star expanded into a red giant and was transformed into a nebula billowed. As its inner layers

a result, for now, which will end and fade over one or two. Its stellar wind, streams of charged particles, rushes out ward in opposite directions, the exhaust from 1 million tons per second. Clouds of gas, dust, and ionized gas, known as nebulae, form, or "bloom." This Mystery, revealed by the Hubble Space Telescope, is common among planetary nebulae. Ultraviolet light from the star is very hot. Jet Nebula's synthetic of molecules glow.

Other types of nebulae exist in our galaxy, including dark nebulae that blanks our view of stars beyond. When a star acquires a dark nebulae, fine dust particles reflect starlight and the black cloud seems to have a silver lining.

3 The million stars were packed into a globular cluster such as Omega Centauri might be seen by astronomers of the Milky Way. Is it a human

LAGOON NEBULA

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Kappa Crucis
NGC 4755
Butterfly
NGC 6302
Carina
NGC 3372
Keyhole N
NGC 6397
Eagle MI6
13
Omega MI7
Lagoon M8
OUR SOLAR SYSTEM
Wild Duck
MII
Twin Jet Nebula
7
Owl
M97
Vela
Trifid M20
NGC 5189
Antares
Ring M57
Zeta Ophiuchi
M7
Cygnus Loop
Dumbbell
M27
NGC 7293
11
NGC 7027
North America
NGC 7000
Orion
M42
Cone NGC 2264
Rosette NGC 2237
O R I O N
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3,000
Crab MI
IC 1848
Soul Nebula
6,000 light-years
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SN 1572

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THE MILKY WAY

NATIONAL GEOGRAPHIC

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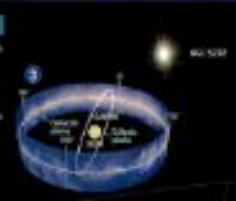

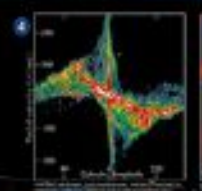

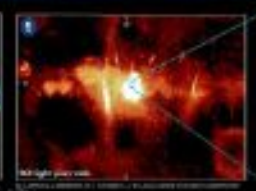

A TURBULENT HEART

4 A graph based on a radio survey reveals the whirlpool motion of interstellar gas on the inner part of our galaxy, gas moving away from Earth. Also built, and toward Earth (bottom half). To demonstrate opposite velocities, below.

5 Massive streamers of energy are released near the center of the Milky Way, perplexing astronomers.

6 Infrared waves disrupt one tiny cloud, a stellar nursery that lies a quarter of the way from the sun to the galactic center. Measuring more distant stars, the cloud was first seen during many years. Its presence is revealed as all stellar explosions.

7 Hydrogen atoms in the cloud's outer layers are ionized (blue) by radiation from the brightest and most massive young star in the cluster, then ejected. Stars and nebulae (purple) are formed by the cloud's inner layers.

8 Dense areas of cold gas that is falling toward what may be a black hole—or so we think—lurk at the center of the Milky Way, positioning.

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TWIN JET NEBULA

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And so our sun will do in a short 7 billion years or five billion years from now, a dying star expanded into a red giant and was transformed into a nebula billowed. As its inner layers

a result, for now, which will end and fade over one or so. Its stellar wind, streams of charged particles, rushes out in all directions, the ejected mass from 1 to 6 suns per century—blasts the plasma, clouds, or "knots." This Hubble image, captured by the Hubble Space Telescope, is common among planetary nebulae. Ultraviolet light from the star is very hot. Jet Nebula's symbol of endless flare-glow.

Other types of celestial objects in our galaxy, including dark nebulae that blanks our view of stars beyond. When a star adjoins a dark nebulae, the stars' particles reflect starlight and the black cloud seems to have a silver lining.

8 The ribbon you were peeled into a globular cluster such as Omega Centauri might see twelve visions of the Milky Way. Six it's human

reflexes, however, every star in the cluster is about the same age, not over 10 billion years old or so.

9 Peering between dust clouds toward the central bulge of the Milky Way, the Hubble Space Telescope focused on a rare close region in the Sagittarius star cloud above right. Three Sagittarius stars (arrows) of different sizes, most are seen

LAGOON NEBULA

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250,000 light-years

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THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Most of these large concentrations are separated by vast sheets or sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic voids.

The great unifier of the cosmos is gravity. It holds the stars of a galaxy, and the galaxies of a cluster, together. But clusters, groups, and isolated individual galaxies are all rising away from each other in a continuing aftermath of the big bang, an explosion of space in which some scientists believe the universe 13 to 15 billion years ago.

1 SIZE OF THE UNIVERSE

So vast is space that we're still discovering new planets even in our own solar system. Astronomers have known for years that Neptune's largest moon, Triton, orbits the planet backward, but only recently did they realize that Triton's retrograde motion is a clue to its origin. Triton is probably a captured object, not a native moon like Earth's. Astronomers suspect that Triton was once a member of the Kuiper belt, a region beyond Neptune's orbit that contains millions of small, icy objects. Triton's gravity may have pulled it away from the Kuiper belt and into its present orbit around Neptune.

Astronomers have also found that Neptune's rings are not continuous, as they appear to be in photographs. Instead they are made up of clumps of dark matter and gravitationally pear as bright centers in the image, which is based on a supercomputer simulation. While the other five are incomplete or faint, Neptune's rings are clearly visible in this image, which was created using the actual positions of the satellite moments.

EVOLUTION OF THE UNIVERSE

Ever since the big bang, the universe has been expanding and cooling. Astronomers have detected clues about the structure of the universe near the big bang and the present in bands. From 100 million years after the big bang—just the beginning of cooling—other and other stars, then galaxies, formed. Billions of years later the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe unfolded.

2 OUR SUPERCLUSTER

Some 150 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters flood in our supercluster, and supports believe a special matter would enter a newly glazed flow region called a cosmic void. Not like the regions within our supercluster is teeming with galaxies. Although the supercluster has a mass equaling some three and billion suns, virtually all its volume is empty. Empty. But it's, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

Recent observations reveal that early in the universe's history galaxies collided and merged more often than they do now. That indicates that they were more numerous in the past and that many have grown larger over billions of years.

Local Group (Milky Way)
Virgo
Ursa Major
Virgo W
Fornax

3 THE LOCAL GROUP

Galaxies stretch in every direction beyond the Milky Way, but gravity keeps a family of some 28 galaxies, including our own, loosely bound.

The Local Group of galaxies extends some two million light-years across. Most galaxies in the group are considered dwarfs, but the two largest—our own Milky Way and the Andromeda galaxy—are giant spirals. Andromeda is at the center of a court subgroup, which includes two elliptical galaxies, M32 and NGC 205, whose star formation has ceased. Even though it is more than two million light-years away from Earth, the Andromeda galaxy can be seen readily with the naked eye. With even a small telescope, its bright bulge is unmistakable.

It is possible that astronomers have not found some of our group's smaller galaxies, which may be hidden behind dust clouds in the Milky Way.

All three main types of galaxies are represented in the Local Group: spirals, ellipticals, and irregulars. Nevertheless, the group has relatively few members, a hundredth that of some large galaxy clusters.

The galaxies of the Local Group are traveling together through space. Measurements show that the Milky Way is falling toward Andromeda. No collision is expected, however. Like race cars on opposite straightaways, the two are most likely at opposite ends of a highly elongated orbit around the group's center of mass.

Andromeda (M31)
Triangulum (M33)
Milky Way
Large Magellanic Cloud
Small Magellanic Cloud

4 OUR GALACTIC REALM

Until the early 20th century the known galaxies were the Milky Way galaxy. Then the Milky Way galaxy was the entire universe. We now know that ours is only one of at least a hundred billion galaxies.

The Milky Way is a spiral galaxy, and our solar system is located in what is called the spiral's Orion arm, about 25,000 light-years from the center. Our own galaxy is a galactic system about once every 225 million years and has made the circuit about 20 times. In the spiral arms, new stars form as clouds of gas and dust condense. The stars' energy makes nearby parts of the clouds glow, causing them to glow.

The central bulge of the galaxy glows with the light of older, redder stars. More ancient stars, orbiting the galaxy in a diffuse halo, formed more than ten billion years ago. Several satellite galaxies, closer to the Milky Way, two of them, the Large and the Small Magellanic Clouds, are visible in the Southern Hemisphere. The closest galaxy is a small spheroid called the Sagittarius Dwarf.

Sagittarius Dwarf
Small Magellanic Cloud
Scorpius
Milky Way
Large Magellanic Cloud
Ursa Major

5 OUR SUN'S NEIGHBORHOOD

The stars residing 30 light-years in all directions from our sun's make up the solar neighborhood. Each light-year measures 5.9 trillion miles, yet the neighborhood is a tiny part of the Milky Way. Most of the stars shown here are too dim to be seen with the naked eye, but a few, such as Sirius and Procyon—greatly exaggerated here and each actually two stars—are treasures in the sky.

The cosmic scene the sun is an ordinary yellow star, average in size and temperature. The brightest stars glow blue, the coolest white and.

Many stars are binary or even triple. Our nearest neighbor is the Alpha Centauri triple system. 4.3 light-years away. Closest of the three is Proxima Centauri (Alpha Centauri C), a red dwarf with 1/10 the mass and 1/13000 the brightness of the sun's.

In recent years astronomers have discovered evidence of planets, similar to Jupiter in mass, orbiting stars. The nearest example is 51 Peg.

Sirius A, B
Procyon A, B
Alpha Centauri A, B
Solar System
Vega
Altair
61 Cygni A, B
Sirius A, B
Castor A, B, C
Pollux

6 OUR SOLAR SYSTEM

A tiny dot on the scale of the universe, the solar system—our home in the galaxy—measures some 44 billion miles from the sun to the farthest source of Pluto's orbit. So might reaches Earth in about 8 minutes and Jupiter in 43 minutes, but it takes nearly 7 hours to pass the orbit of Pluto.

Beyond Neptune are icy bodies smaller than planets. Three are Kuiper belt objects, over a hundred of which have been observed by telescope. Some scientists suggest that Pluto is a Kuiper belt object, rather than a planet. Spread in a great sphere around the entire solar system is the Oort cloud, billions of comets, a few of which make spectacular visits to the sun.

PLUTO
NEPTUNE
URANUS
MERCURY
SATURN
VENUS
MARS
JUPITER
EARTH
SATURN

THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Most clusters are connected by filaments or sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic voids.

The great unifier of the cosmos is gravity. It holds the stars of a galaxy, and the galaxies of a cluster, together. But clusters, groups, and isolated individual galaxies are all rising away from each other as a continuing aftermath of the big bang, an explosion of spacetime that astronomers believe started the universe 13 to 15 billion years ago.

EVOLUTION OF THE UNIVERSE

Ever so long ago—so far—expanses of the universe were filled with a uniform soup of protons, neutrons, and electrons. Scientists have theorized about the structure of the universe from the big bang to the present in bursts. From 1 billionth to 1 billionth of a second after the big bang—just the beginning of unimaginably small stirrings. Before any stars. Perhaps 1 billion years later the first galaxies formed. As clusters of matter accumulated, the filament-and-void structure of today's universe unfolded.

1 SIZE OF THE UNIVERSE

So vast is space that we've had to find other ways to measure it. In the background image on this sheet we use a metric sliver of the sky—roughly one ten-millionth of the diameter of the observable universe—yet even the smallest dot represents not stars or galaxies but whole conglomerations of galaxies. Ignored are gulfs of dark matter and gravitationally pure, bright centers in the image, which is based on a supercomputer simulation. While the other lines are incomplete and slightly inaccurate, the distances among the galaxies are precise.

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Some 100 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know carries the gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

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3 THE LOCAL GROUP

Galaxies stretch in every direction from the Milky Way, but gravity keeps a family of some 35 galaxies, including our own, loosely bound.

The Local Group of galaxies extends some two million light-years across. Most galaxies in the group are considered dwarfs, but the two largest—our own Milky Way and the Andromeda galaxy—are giant spirals. Andromeda is at the center of a court subgroup; a whole universe has elliptical galaxies, M32 and NGC 205, where star formation has ceased. Even though it is more than two million light-years away from Earth, the Andromeda galaxy can be seen readily with the naked eye. With even a small telescope, its bright bulge is unmistakable.

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In several cases the pairs are ordinary yellow star, average in size and temperature. The faint ones glow blue, the coolest white-hot.

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A tiny dot on the scale of the universe, the solar system—our home in the galaxy—measures some 4.6 billion miles from the sun to the farthest bounds of Pluto's orbit. At eight miles to Earth in about 8 minutes and Jupiter in 43 minutes, but it takes nearly 7 hours to pass the orbit of Pluto.

Beyond Neptune are ice bodies smaller than planets. These are Kuiper belt objects, over a hundred of which have been observed by telescope. Some astronomers suggest that Pluto is a Kuiper belt object, rather than a planet. Spread in a great sphere around the edge solar system is the Oort cloud, billions of comets, a few of which make spectacular visits to the sun.

THE UNIVERSE

NATIONAL GEOGRAPHIC

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The great unifier of the cosmos is gravity. It holds the stars of a galaxy, and the galaxies of a cluster, together. But clusters, groups, and isolated individual galaxies are all flying away from each other, a continuing aftermath of the big bang, an explosion of spacetime that astronomers believe formed the universe 12 to 15 billion years ago.

EVOLUTION OF THE UNIVERSE

Ever since astronomer Edwin Hubble announced in 1929 that the universe was expanding, scientists have debated about the structure of the universe now, the big bang, and the universe's future. From 380,000 years after the big bang—a period of unimaginably hot, dense energy—to the present is known. From 380,000 years to 1 billion years after the big bang—a period of unimaginably hot, dense energy—to the present is known. From 1 billion years to 13.7 billion years after the big bang—a period of unimaginably hot, dense energy—to the present is known.

1 SIZE OF THE UNIVERSE

So vast is space that we tend to find other solar systems unremarkable. We have become blasé to scale. In the background image on this sheet we see a representative slice of the sky—roughly one-billionth part of the diameter of the known universe. Each dot represents not stars or galaxies but huge conglomerations of galaxies, ghostly agglomerations of dark matter, and gravitationally lensed, bright-centered arcs. The image, which is based on a supercomputer simulation, reveals the filaments and voids that astronomers believe characterize the distribution of the visible universe.

2 OUR SUPERCLUSTER

Some 150 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters flood in our supercluster, and supports, before a special matter would enter a nearly gluelike flow region called a cosmic void. Not that the region within our supercluster is teeming with galaxies. Although the supercluster has a mean spacing some three and a half billion suns, virtually all its volume is empty. Empty, that is, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

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Local Group (Milky Way)
Virgo
Ursa Major
Virgo W
Fornax

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Andromeda (M31)
Triangulum (M33)
Milky Way
Large Magellanic Cloud
Small Magellanic Cloud
Sculptor
Ursa Major

4 OUR GALACTIC REALM

Until the early 20th century the best guess of astronomers was that the Milky Way galaxy was the entire universe. We now know that ours is only one of at least a hundred billion galaxies.

The Milky Way is a spiral galaxy, and our solar system is located in what is called the spiral's Orion arm, about 25,000 light-years from the center. Our sun orbits the galactic center about once every 225 million years and has made the circuit about 20 times. In the spiral arms, new stars form as shock waves of gas and dust condense. The stars' energy ionizes nearby parts of the clouds, causing them to glow.

The center bulge of the galaxy glows with the light of older, redder stars. More ancient stars, orbiting the galaxy in a diffuse halo, formed even earlier, perhaps 13 billion years ago. Several satellite galaxies (never named the Milky Way. Two of them, the Large and the Small Magellanic Clouds, are visible on Earth only from the Southern Hemisphere. The closest galaxy is a small spheroid called the Sagittarius Dwarf.

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The stars reaching 20 light-years in all directions from our sun's make up the solar neighborhood. Each light-year measures 5.9 trillion miles, yet the neighborhood is a tiny part of the Milky Way. Most of the stars shown here are too dim to be seen with the naked eye, but a few, such as Sirius and Procyon—probably were visited here and each as only here stars—are because to the sky.

In general terms the sun is an ordinary yellow star, average in size and temperature. The brightest stars glow blue, the coolest white-red.

Many stars are binary or even triple. Our nearest neighbor is the Alpha Centauri triple system, 4.3 light-years away. Closest of the three is Proxima Centauri (Alpha Centauri C), a red dwarf with 1/10 the mass and 1/13,000 the brightness of the sun.

In recent years astronomers have discovered billions of planets, similar to Jupiter in mass, orbiting stars. The closest example is 51 Peg.

Sirius
Procyon A, B
Alpha Centauri A, B
Proxima Centauri
Solar System

6 OUR SOLAR SYSTEM

A tiny dot on the scale of the universe, the solar system—our home in the galaxy—measures some 4.6 billion miles from the sun to the farthest extent of Pluto's orbit. Sunlight reaches Earth in about 8 minutes and Jupiter in 43 minutes, but it takes nearly 7 hours to pass the orbit of Pluto.

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SUN
MERCURY
VENUS
EARTH
MARS
JUPITER
SATURN
URANUS
NEPTUNE
PLUTO

able universe—yet even the smallest dots represent not stars or galaxies

(right), mapped using the actual positions of its celestial elements.

2 million light-years

1 million

Leo II

Leo I

Draco

Ursa Minor

Sextans

Milky Way

Sagittarius

Large Magellanic Cloud

Small Magellanic Cloud

Carina

NGC 6822

Sculptor

IC 10

And VII

NGC 185

Fornax

NGC 147

And V

Andromeda (M31)

DDO 210

M110 (NGC 205)

M32

And II

And III

And I

And VI

Triangulum (M33)

Phoenix

LGS 3

Pegasus

THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Alike in their large-scale architecture, the cosmos consists of sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic voids.

The great unifier of the cosmos is gravity. It holds the stars of a galaxy, and the galaxies of a cluster, together. But clusters, groups, and isolated individual galaxies are all flying away from each other, a continuing aftermath of the big bang, an explosion of spacetime that astronomers believe formed the universe 12 to 15 billion years ago.

EVOLUTION OF THE UNIVERSE

1 SIZE OF THE UNIVERSE

2 OUR SUPERCLUSTER

3 THE LOCAL GROUP

4 OUR GALACTIC REALM

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EVOLUTION OF THE UNIVERSE

Ever since the 1920s, when Edwin Hubble discovered that the universe is expanding, scientists have theorized about the structure of the universe now—the big bang is the present is known. From 1 billion to 3 billion years after the big bang—just the beginning of creating stars and galaxies. Billions of years later the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe unfolded.

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So vast is space that we have to find other ways to measure it. In the background image on this sheet we see a wedge-shaped slice of the sky—roughly one-billionth part of the diameter of the known universe. Each dot in the wedge, which is based on a supercomputer simulation, represents not stars or galaxies but huge conglomerations of galaxies, ghostly agglomerations of dark matter, and gravitationally lensed, bright-centered arcs. Within the wedge, which is based on a supercomputer simulation, White and other astronomers have mapped the positions of hundreds of thousands of galaxies.

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Some 100 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know harbors a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

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Local Group
Milky Way
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Galaxies stretch in every direction beyond the Milky Way, but gravity keeps a family of some 30 galaxies, including our own, loosely bound.

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EVOLUTION OF THE UNIVERSE

Ever so long ago in an era—represented at the bottom of page 1—some 90 billion years before the present, scientists have theorized about the structure of the universe was the big bang. Since the present is known. From 400 million years after the big bang—just the beginning of what is called "the dark ages"—the first stars and galaxies formed. Over billions of years accumulated, the Sloan's vast web structure of today's universe unfolded.

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75 million light-years
50 million
25 million
NGC 5907
NGC 5248
NGC 6946
NGC 5487
NGC 5055
NGC 5194
NGC 4565
Virgo
NGC 4571
M87
M100
Ursa Major
Virgo W
NGC 5236
NGC 4826
NGC 4631
NGC 4656
NGC 4594
NGC 5128
IC 342
Local Group
(Milky Way)
NGC 3031
NGC 253
NGC 3623,
3627, 3628
NGC 4038/4039
NGC 3593
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NGC 2903
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NGC 1566


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THE UNIVERSE

NATIONAL GEOGRAPHIC

As far as we can see with our ever-improving telescopes, there are at least a hundred billion galaxies arrayed throughout the universe. Each, like the Milky Way, is an "island universe" containing billions of stars. Nearly all galaxies are members of groups or clusters, which are part of even larger structures called superclusters. Most of these large concentrations are separated by vast voids or sheets of galaxies, which enclose huge, bubble-like volumes of empty space, the cosmic fields.

The great unifier of the cosmos is gravity. It holds the stars of a galaxy, and the galaxies of a cluster, together. But clusters, groups, and isolated individual galaxies are all flying away from each other, a continuing aftermath of the big bang, an explosion of spacetime that astronomers believe created the universe 12 to 15 billion years ago.

1 SIZE OF THE UNIVERSE

So vast is space that not to scale—the solar system would be just a dot, too small to see. In the background image on this sheet we see a representative slice of the sky—roughly one ten-thousandth of the diameter of the observable universe—yet even the smallest dots represent not stars or galaxies but huge conglomerations of galaxies, ghostly wisps of dark matter, and gravitationally bent light rendered as bright arcs in the image, which is based on a supercomputer simulation. While the other five are incomplete (right), nascent using the actual positions of the visible elements.

2 OUR SUPERCLUSTER

Some 150 million light-years across, our supercluster is a giant aggregation of clusters of galaxies. The supercluster is centered on the Virgo cluster, which itself contains thousands of galaxies. Among them is M87, which astronomers now know contains a gigantic black hole. Virgo's gravity affects the movements of its neighbors, including the Local Group.

Virgo, the Ursa Major clusters, and other clusters flood in our supercluster, and supports, before a special matter would enter a nearly gluelike flow region called a cosmic void. Not that the region within our supercluster is teeming with galaxies. Although the supercluster has a mean spacing some three and billion suns, virtually all its volume is empty. Empty. But it's, except for a considerable density of dark matter, the hidden mass of the universe that helps hold galaxies and clusters together.

Recent observations reveal that early in the universe's history galaxies collided and merged more often than they do now. That indicates that they were more numerous in the past and that many have grown larger over billions of years.

3 THE LOCAL GROUP

Galaxies stretch in every direction beyond the Milky Way, but gravity keeps a family of some 30 galaxies, including our own, loosely bound.

The Local Group of galaxies extends some two million light-years across. Most galaxies in the group are considerably dwarfs, but the two largest—our own Milky Way and the Andromeda galaxy—are giant spirals. Andromeda is at the center of a small subgroup; a whole includes two elliptical galaxies, M32 and NGC 205, whose star formation has ceased. Even though it is more than two million light-years away from Earth, the Andromeda galaxy can be seen readily with the naked eye. With even a small telescope, its bright bulge is unmistakable.

It is possible that astronomers have not found some of our group's smaller galaxies, which may be hidden behind dust clouds in the Milky Way.

All three existing types of galaxies are represented in the Local Group: spirals, elliptical, and irregulars. Nevertheless, the group has relatively few members, a hundredth that of some large galaxy clusters.

The galaxies of the Local Group are traveling together through space. Measurements show that the Milky Way is falling toward Andromeda. No collision is expected, however. Like race cars on opposite straightaways, the two are most likely at opposite ends of a highly elongated orbit around the group's center of mass.

4 OUR GALACTIC REALM

Until the early 20th century the best guess of astronomers was that the Milky Way galaxy was the entire universe. We now know that ours is only one of at least a hundred billion galaxies.

The Milky Way is a spiral galaxy, and our solar system is located in what is called the spiral's Orion arm, about 26,000 light-years from the center. Our sun orbits the galactic center about once every 225 million years and has made the circuit about 20 times in the spiral arms, new stars form as clouds of gas and dust condense. The stars' energy causes nearby parts of the clouds, causing them to glow.

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EVOLUTION OF THE UNIVERSE

Ever since Edwin Hubble first observed that the galaxies of space were moving away from us, astronomers have theorized about the dynamics of the universe over the big bang to the present is known. From 1 billion that radiation and matter uncoupled—380,000 years after the big bang—gravity began creating order from the chaotic. From one billion years after the big bang, the first galaxies formed. As clusters of galaxies accumulated, the filament-and-void structure of today's universe unfolded.

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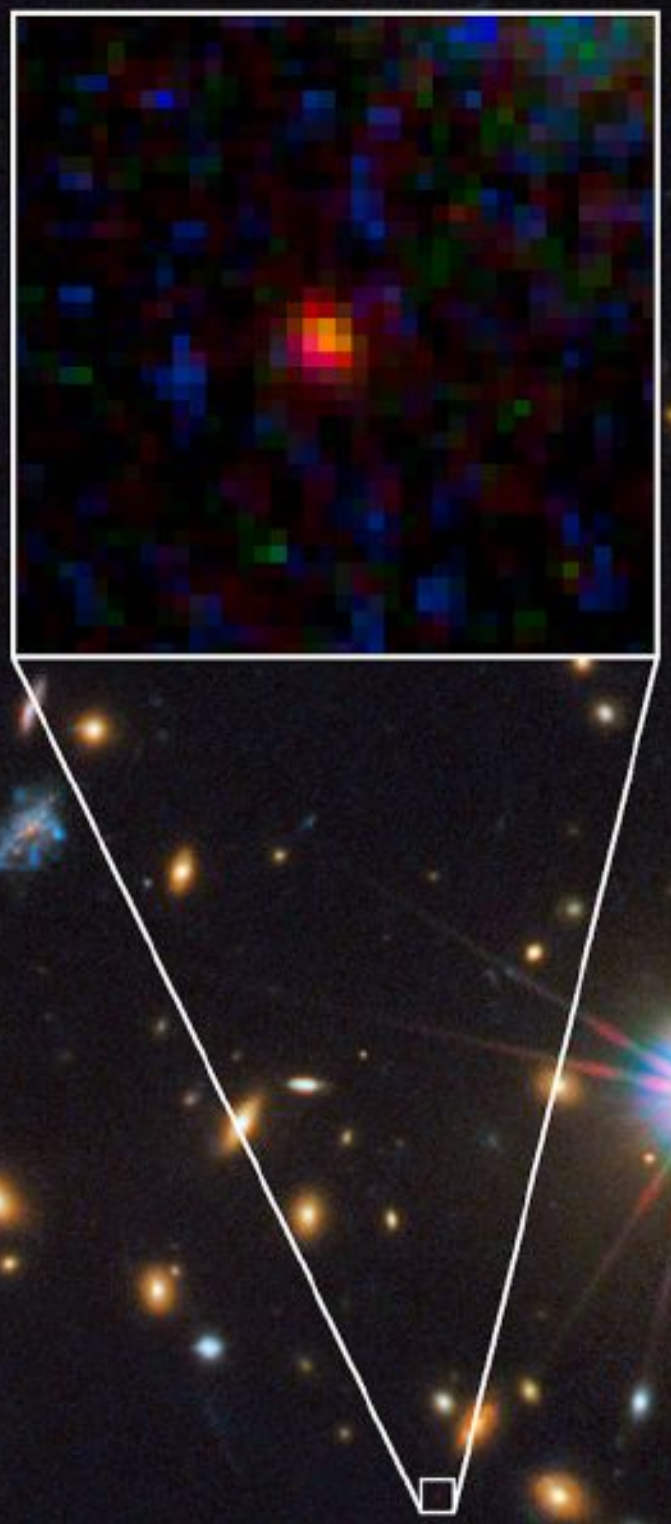
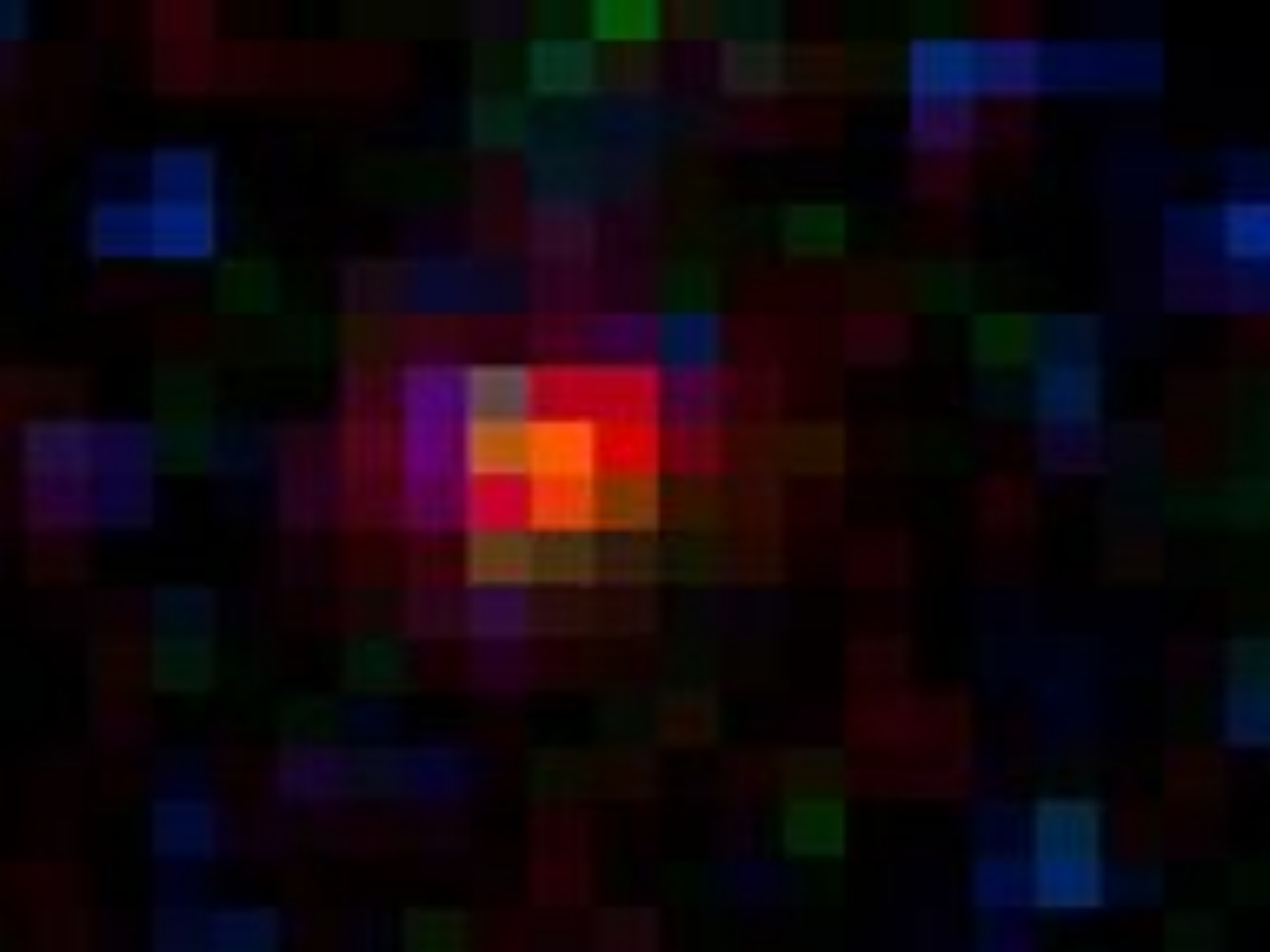
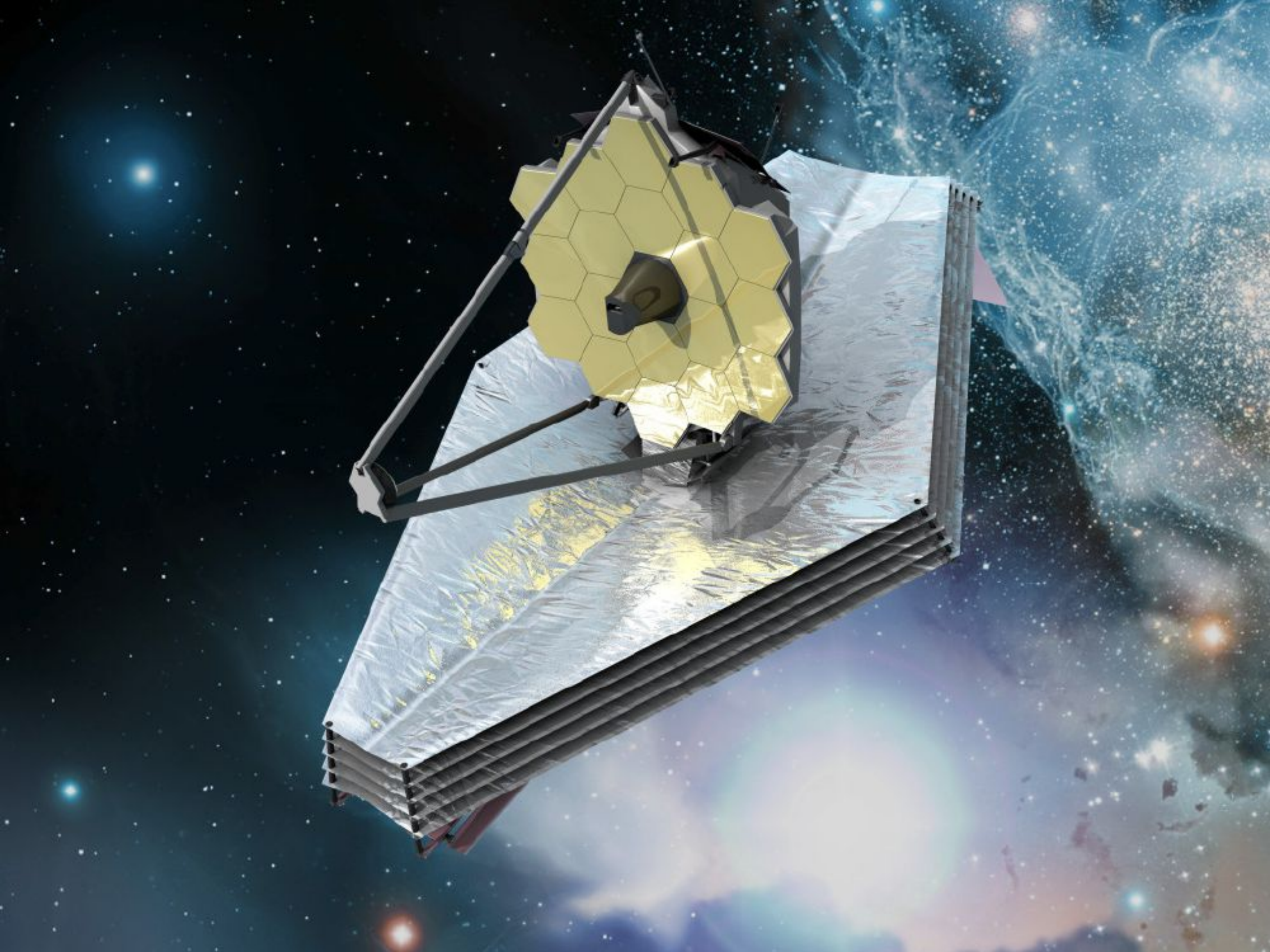
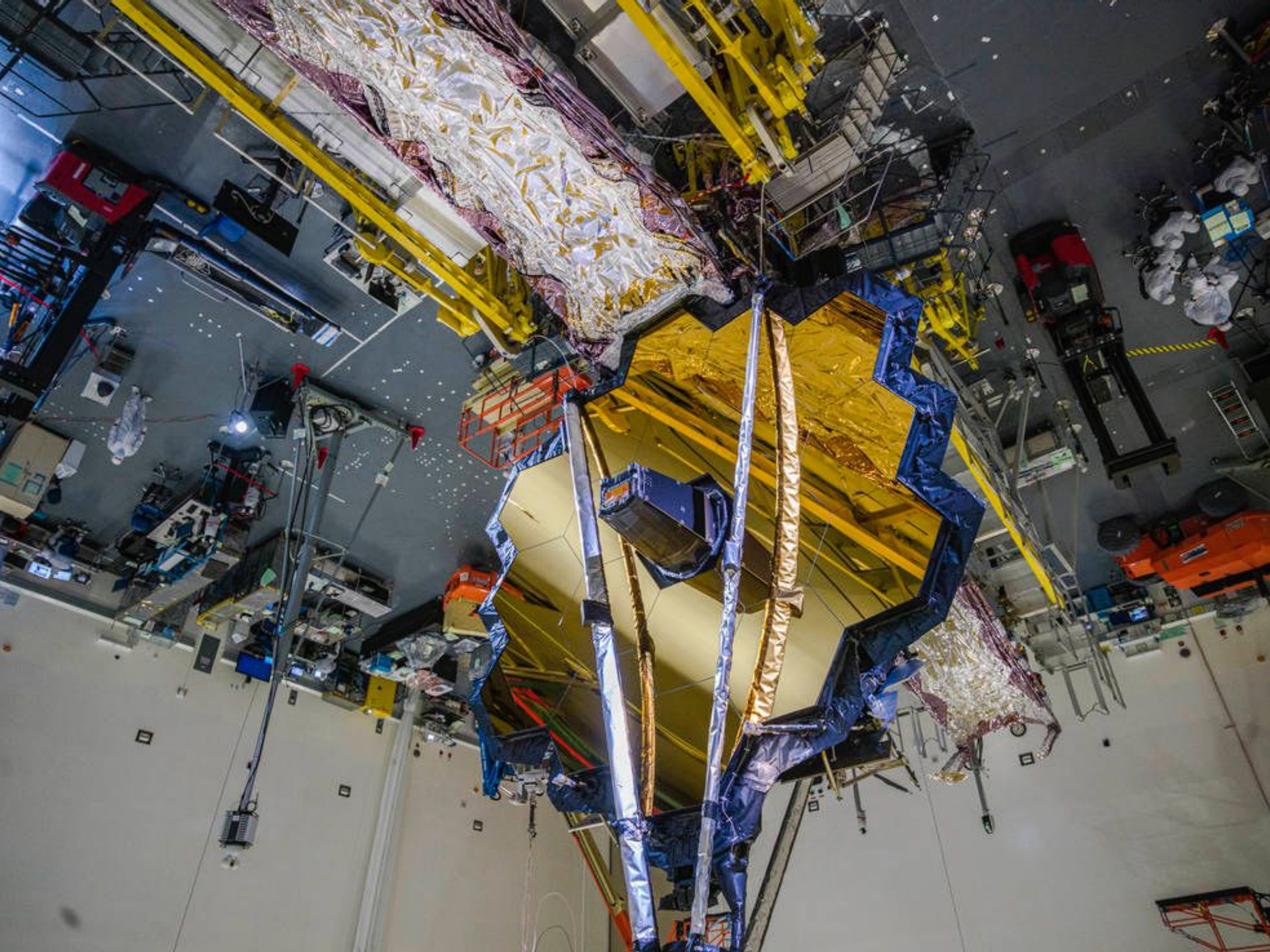
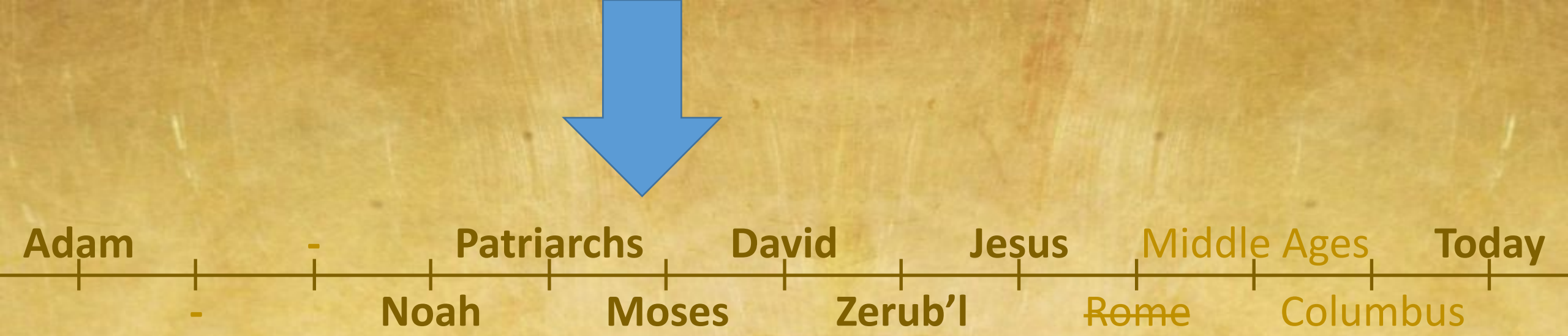










3 Days Partitioning / 3 Days Populating

Day 1 – Light / Dark

Day 2 – Water / Air

Day 3 – Water / Land

+ Vegetation

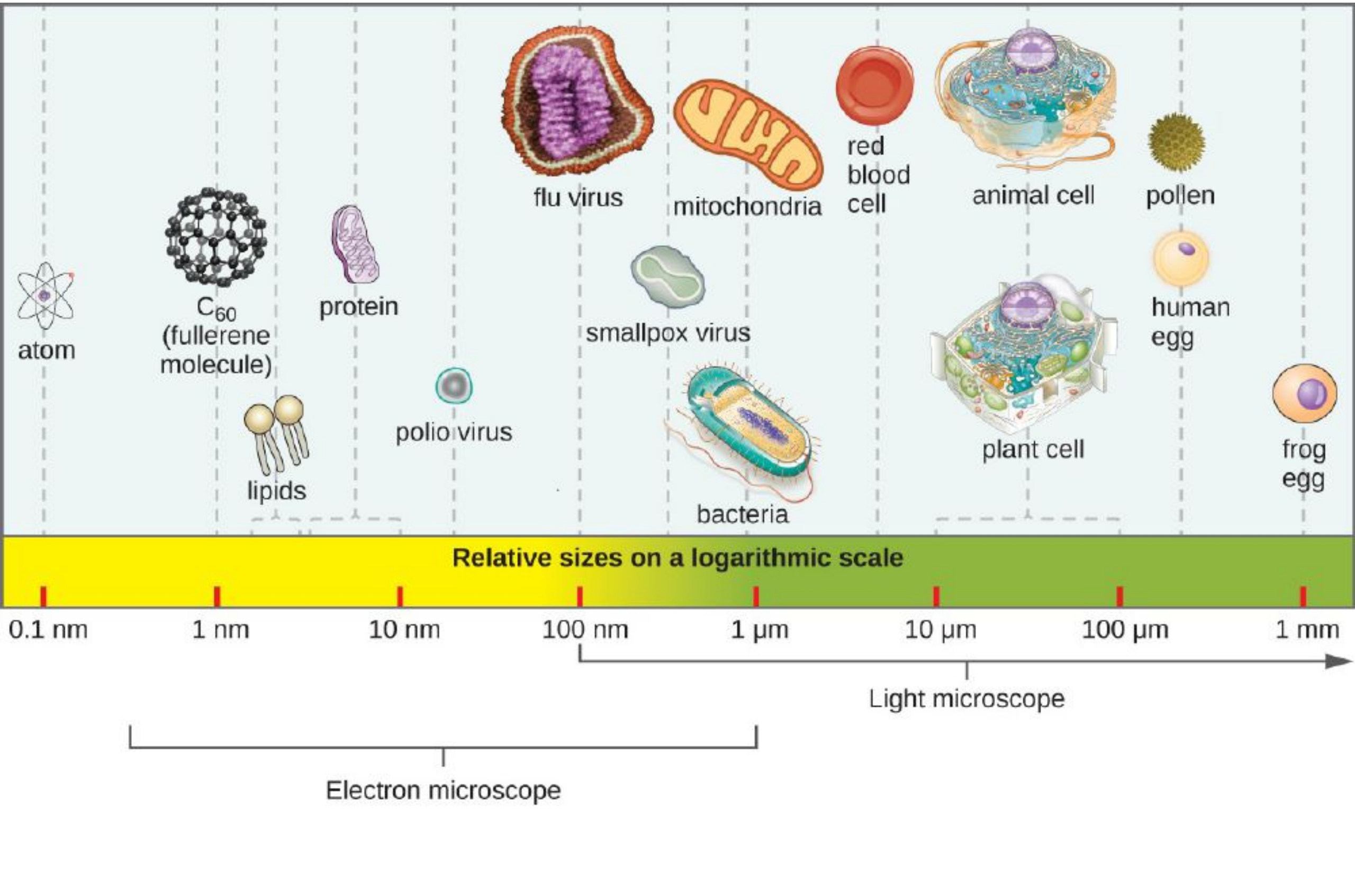
Day 4 – Sun / Moon / Stars

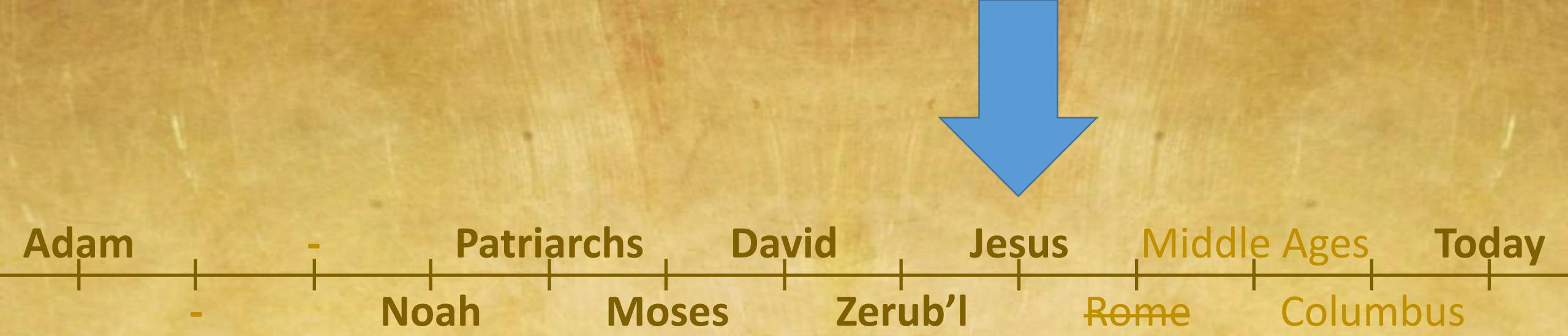
Day 5 – Water / Air creatures

Day 6 – Land creatures

Matt 2:7 Then Herod, when he had secretly called the wise men, determined from them what time the star appeared. 8 And he sent them to Bethlehem and said, “Go and search carefully for the young Child, and when you have found Him, bring back word to me, that I may come and worship Him also.”

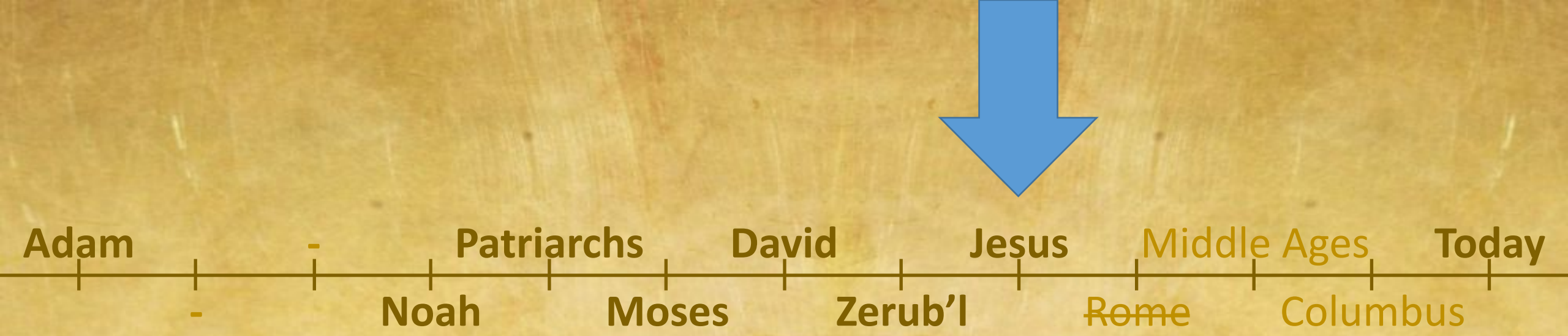
Microscopic Universe


atom
C_{60} (fullerene molecule)
protein
lipids
polio virus
flu virus
mitochondria
red blood cell
smallpox virus
bacteria
animal cell
pollen
human egg
plant cell
frog egg
Relative sizes on a logarithmic scale
0.1 nm
1 nm
10 nm
100 nm
1 µm
10 µm
100 µm
1 mm
Light microscope
Electron microscope



Jesus, the son of …

Matt	Mark	Luke	John
Jews	Romans	Intellects	World
… David	… Man	… Adam	… God



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The Genealogy of Christ Through Mary

Gen. 5:1–32; 11:10–26; Ruth 4:18–22; 1 Chr. 1:1–4, 24–27, 34; 2:1–15; Matt. 1:2–6

23 Now Jesus Himself began *His ministry at* [w]about thirty years of age, being (as was
supposed) [x]*the* son of Joseph, *the son* of Heli, 24 *the son* of Matthat, *the son* of Levi, *the son* of
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[12] And after they were brought to Babylon, [u]Jeconiah begot Shealtiel, and Shealtiel begot [v]Zerubbabel. [13] Zerubbabel begot Abiud, Abiud begot Eliakim, and Eliakim begot Azor. [14] Azor begot Zadok, Zadok begot Achim, and Achim begot Eliud. [15] Eliud begot Eleazar, Eleazar begot Matthan, and Matthan begot Jacob. [16] And Jacob begot Joseph the husband of [w]Mary, of whom was born Jesus who is called Christ.

[17] So all the generations from Abraham to David *are* fourteen generations, from David until the captivity in Babylon *are* fourteen generations, and from the captivity in Babylon until the Christ *are* fourteen generations.

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[2] [d]Abraham begot Isaac, [e]Isaac begot Jacob, and Jacob begot[f] Judah and his brothers. [3] [g]Judah begot Perez and Zerah by Tamar, [h]Perez begot Hezron, and Hezron begot Ram. [4] Ram begot Amminadab, Amminadab begot Nahshon, and Nahshon begot Salmon. [5] Salmon begot [i]Boaz by Rahab, Boaz begot Obed by Ruth, Obed begot Jesse, [6] and[j] Jesse begot David the king.

[k]David the king begot Solomon by her [2]*who had been the wife* of Uriah. [7] [l]Solomon begot Rehoboam, Rehoboam begot [m]Abijah, and Abijah begot [3]Asa. [8] Asa begot [n]Jehoshaphat, Jehoshaphat begot Joram, and Joram begot [o]Uzziah. [9] Uzziah begot Jotham, Jotham begot [p]Ahaz, and Ahaz begot Hezekiah. [10] [q]Hezekiah begot Manasseh, Manasseh begot [4]Amon, and Amon begot [r]Josiah. [11] [s]Josiah begot [5]Jeconiah and his brothers about the time they were [t]carried away to Babylon.

[12] And after they were brought to Babylon, [u]Jeconiah begot Shealtiel, and Shealtiel begot [v]Zerubbabel. [13] Zerubbabel begot Abiud, Abiud begot Eliakim, and Eliakim begot Azor. [14] Azor begot Zadok, Zadok begot Achim, and Achim begot Eliud. [15] Eliud begot Eleazar, Eleazar begot Matthan, and Matthan begot Jacob. [16] And Jacob begot Joseph the husband of [w]Mary, of whom was born Jesus who is called Christ.

[17] So all the generations from Abraham to David *are* fourteen generations, from David until the captivity in Babylon *are* fourteen generations, and from the captivity in Babylon until the Christ *are* fourteen generations.

Genealogy of Christ

Ruth 4:18–22; 1 Chr. 1:34, 2:1–15; Luke 3:31–34

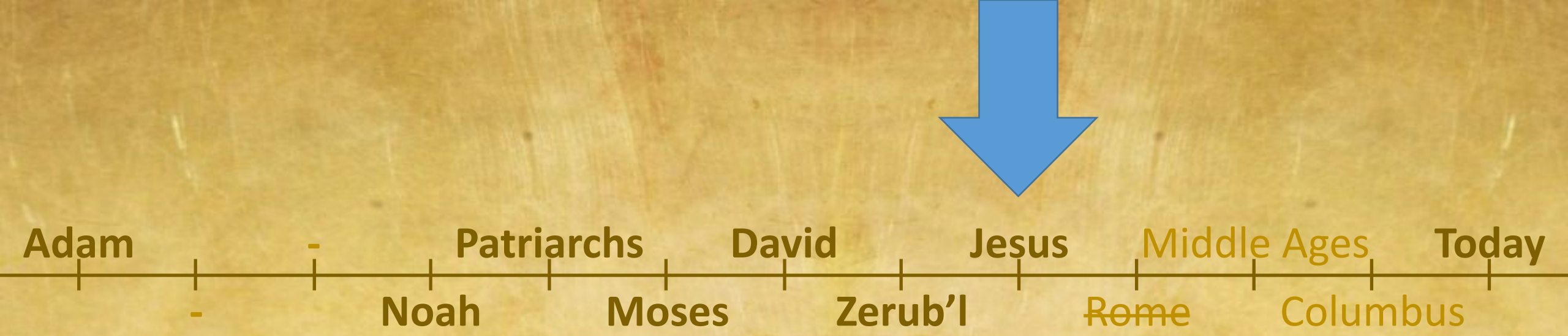
1 The book of the [a]genealogy [1]of Jesus Christ, [b]the Son of David, [c]the Son of Abraham.

2 [d]Abraham begot Isaac, [e]Isaac begot Jacob, and Jacob begot [f] Judah and his brothers. 3 [g]Judah begot
Perez and Zerah by Tamar, [h]Perez begot Hezron, and Hezron begot Ram. 4 Ram begot Amminadab,
Amminadab begot Nahshon, and Nahshon begot Salmon. 5 Salmon begot [i]Boaz by Rahab, Boaz
begot Obed by Ruth, Obed begot Jesse, 6 and [j] Jesse begot David the king.

[k]David the king begot Solomon by her [2]*who had been the wife* of Uriah. 7 [l]Solomon begot
Rehoboam, Rehoboam begot [m]Abijah, and Abijah begot [3]Asa. 8 Asa begot [n]Jehoshaphat, Jehoshaphat
begot Joram, and Joram begot [o]Uzziah. 9 Uzziah begot Jotham, Jotham begot [p]Ahaz, and Ahaz begot
Hezekiah. 10 [q]Hezekiah begot Manasseh, Manasseh begot [4]Amon, and Amon begot [r]Josiah. 11 [s]Josiah
begot [5]Jeconiah and his brothers about the time they were [t]carried away to Babylon.

12 And after they were brought to Babylon, [u]Jeconiah begot Shealtiel, and Shealtiel begot [v]Zerub-
babel. 13 Zerubbabel begot Abiud, Abiud begot Eliakim, and Eliakim begot Azor. 14 Azor begot Zadok,
Zadok begot Achim, and Achim begot Eliud. 15 Eliud begot Eleazar, Eleazar begot Matthan, and
Matthan begot Jacob. 16 And Jacob begot Joseph the husband of [w]Mary, of whom was born Jesus who
is called Christ.

17 So all the generations from Abraham to David *are* fourteen generations, from David until the cap-
tivity in Babylon *are* fourteen generations, and from the captivity in Babylon until the Christ *are* four-
teen generations.



Differences in the Gospels

Theme	Matthew (Abraham)	Luke (Adam)
Ancestry	Legal Family	Natural Family
Political	Royal Heirs	Legal Heirs
Family	Joseph's Line	Mary's Line

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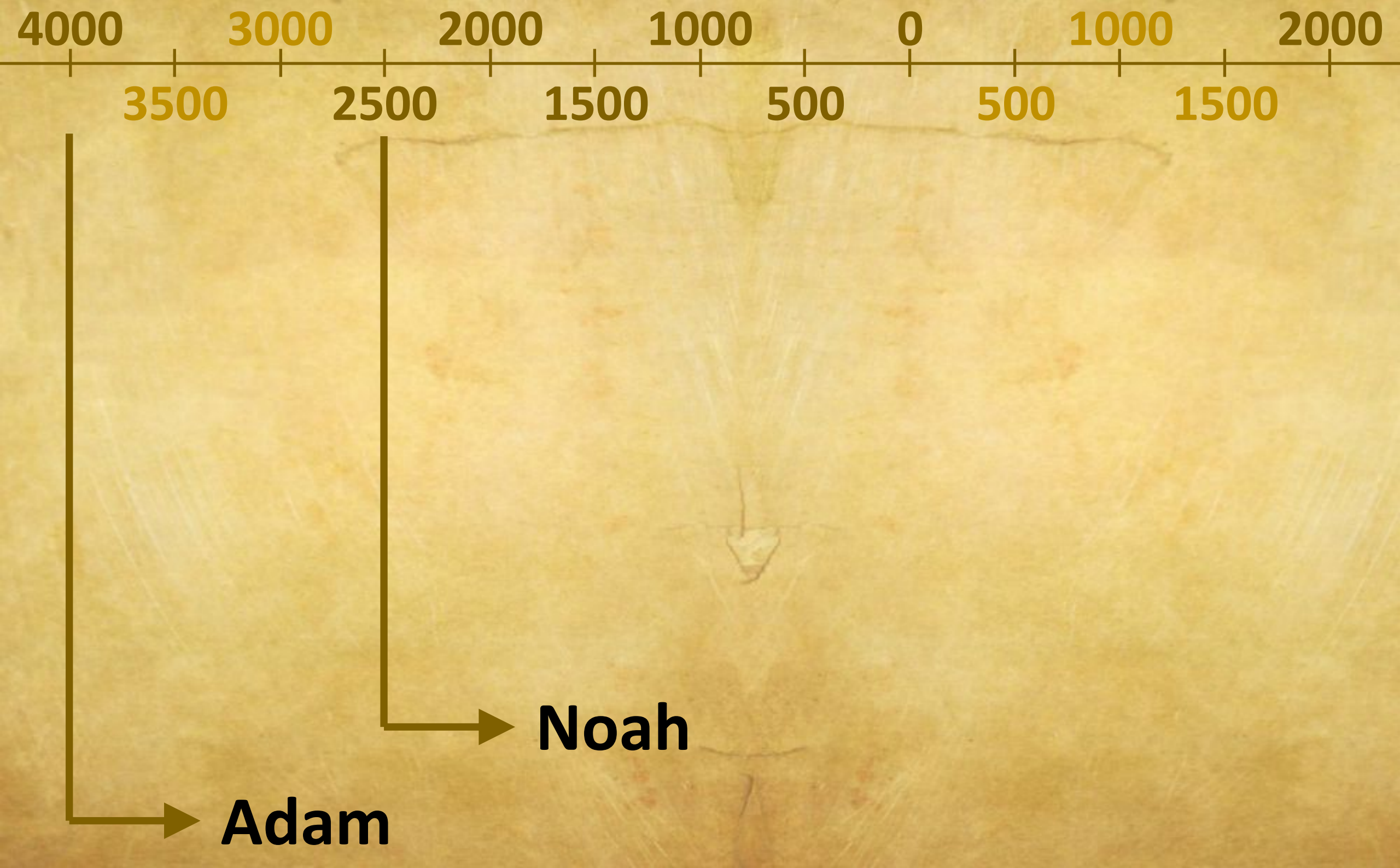
3500 2500 1500 500 500 1500

Adam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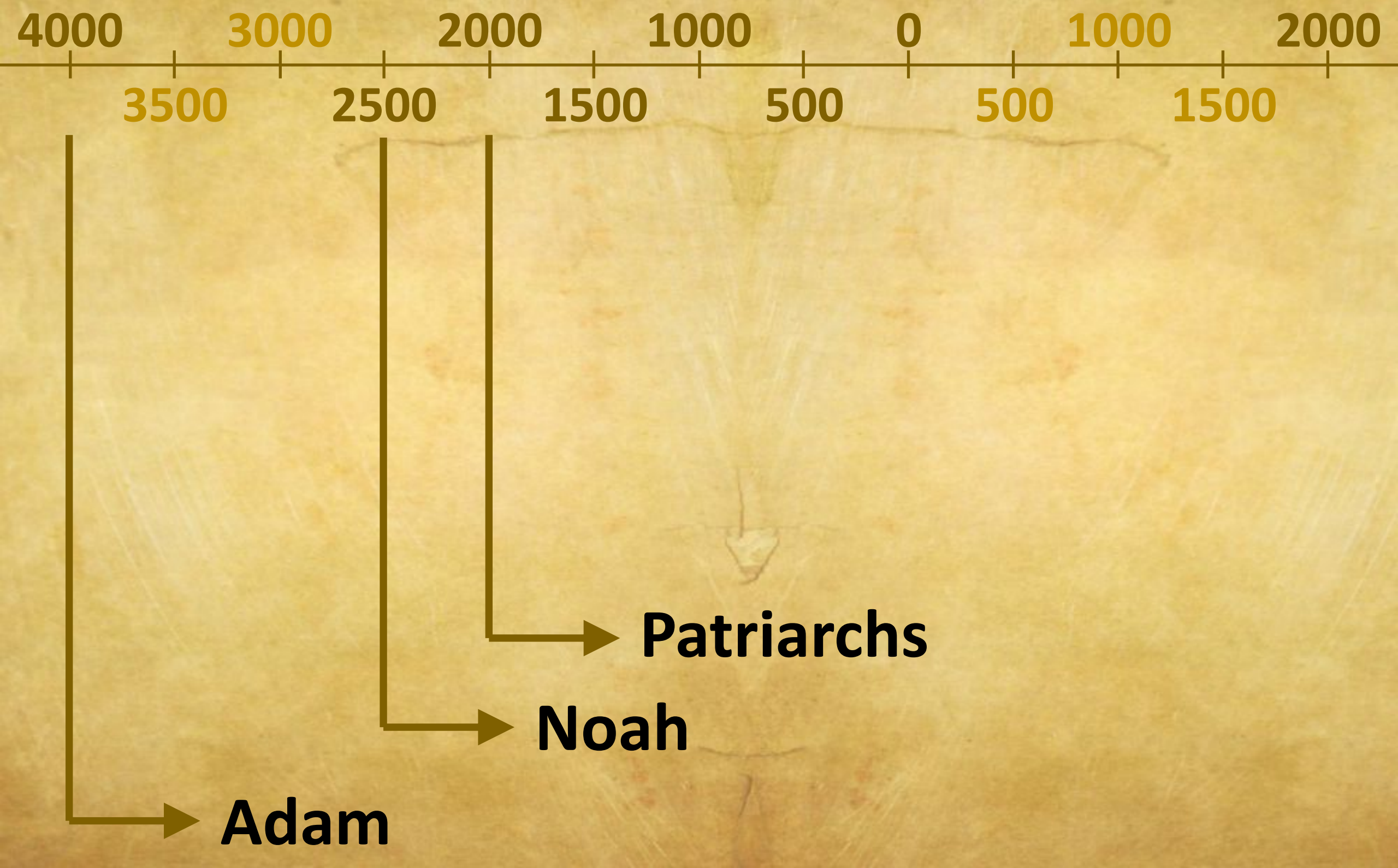
Noah
Adam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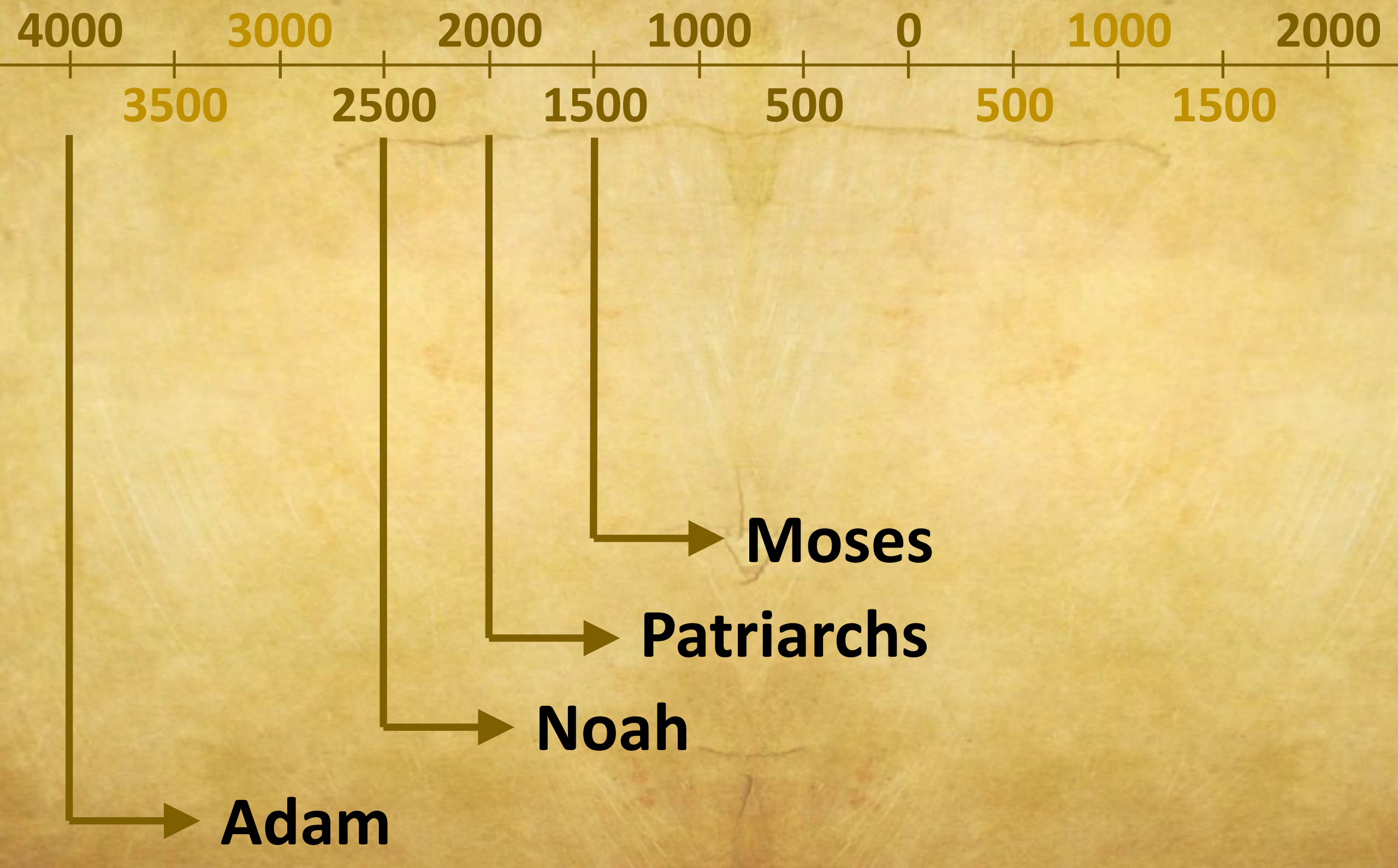
Patriarchs
Noah
Adam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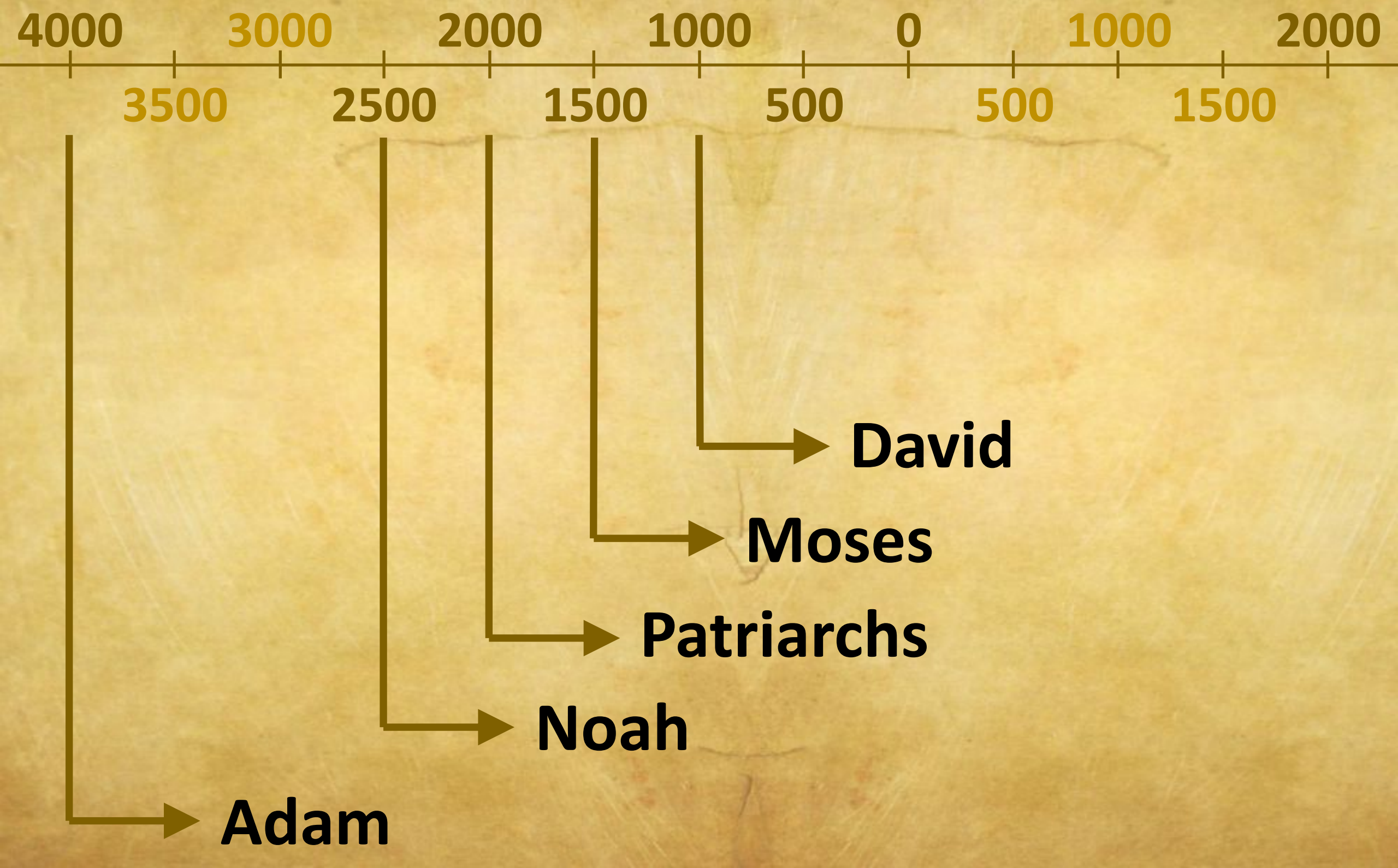
Moses
Patriarchs
Noah
Adam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David
Moses
Patriarchs
Noah
Adam

4000 3000 2000 1000 0 1000 2000

3500 2500 1500 500 500 1500

Zerubbabel

David

Moses

Patriarchs

Noah

Adam

4000 3000 2000 1000 0 1000 2000

3500 2500 1500 500 500 1500

Jesus

Zerubbabel

David

Moses

Patriarchs

Noah

Adam

6000 Years

4000 3000 2000 1000 0 1000 2000

3500 2500 1500 500 500 1500

Jesus

Zerubbabel

David

Moses

Patriarchs

Noah

Adam

What is the secret of the Universe?

Matt 24:36 “But of that day and hour no one knows, not even the angels of heaven, but My Father only. 37 But as the days of Noah were, so also will the coming of the Son of Man be. 38 For as in the days before the flood, they were eating and drinking, marrying and giving in marriage, until the day that Noah entered the ark, 39 and did not know until the flood came and took them all away, so also will the coming of the Son of Man be.

Matt 24:44 Therefore you also be ready, for the Son of Man is coming at an hour you do not expect.