“I am enough of an artist to draw freely upon my imagination. Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.”

Albert Einstein, 1929
Interview in The Saturday Evening Post
Tomb of Pharoah Seti I (c. 1275 BC)

Nicolaus Copernicus

Johannes Kepler

Giordano Bruno
Lecture 46: This View of Life

### Galileo Galilei (1564-1642)

- **East**
  - ![Telescope and Moon](image)

<table>
<thead>
<tr>
<th>East</th>
<th>West</th>
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<tbody>
<tr>
<td><img src="image" alt="Galileo Image" /></td>
<td><img src="image" alt="Moon Image" /></td>
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</table>

### Isaac Newton (1642-1727)

- **East**
  - ![Newton Portrait](image)

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<th>East</th>
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<tbody>
<tr>
<td><img src="image" alt="Newton Portrait" /></td>
<td><img src="image" alt="Newton's Principia" /></td>
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</table>
The Hutton Unconformity
Jedburgh, Scotland

Recent sediments

Older sediments uplifted and tilted
Canadian Archaean Shield

4.3 Gyr old Zircons

4.28 Gyr rock in Canada
Lecture 46: This View of Life

Gregor Mendel

Watson & Crick

Gregor Mendel

Watson & Crick

Charles Darwin (1809-1882)

HMS Beagle in Tierra del Fuego

On The Origin of Species (London, 1859)
Lecture 46: This View of Life

The 22 Amino Acids of Life on Earth

L-Alanine, L-Arginine, L-Asparagine, L-Aspartic Acid, L-Cysteine, L-Glutamic acid, L-Glutamine, Glycine, L-Histidine, L-Isoleucine, L-Leucine, L-Lysine, L-Methionine, L-Phenylalanine, L-Proline, L-Serine, L-Threonine, L-Tryptophan, L-Tyrosine, L-Valine, L-Pyrolysine, L-Selenocysteine
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- DNA
- ATP (Adenosine Triphosphate)

Diagram showing the structure of DNA and ATP molecules.
Lecture 46: This View of Life
Lecture 46: This View of Life

- Bangiomorpha pubescens
  - Hunting Formation, Canada

- Dickinsonia costata
  - (Ediacara, S. Australia)

- Fossil cyanobacteria

Images credit: Chris Butler 2009
Chengjiang fauna

Pikaia gracilens

Carboniferous Period Forest
Lecture 46: This View of Life

[Image of Earth]

[Image of Mars]
Lecture 46: This View of Life

Sublimating water ice on Mars

Eberswalde Delta
Lecture 46: This View of Life

The Methane Lakes of Titan
Lecture 46: This View of Life

Planets Orbiting HR 8799
(Sept. 2008)

July 2001
July 2004
July 2008

0.5 arcsec
20 AU

Planets Orbiting HR 8799
(Sept. 2008)
Lecture 46: This View of Life

Got an Atmosphere?
Got Water?
Got Oxygen?
Got Life?

From NASA Origins website
Lecture 46: This View of Life

Pioneer 10 Plaque

Voyager Record
Lecture 46: This View of Life
Lecture 46: This View of Life

Hubble Deep Field

Earth from Voyager 1
(6.4 Billion km away)
"Pale Blue Dot"

1990 February 14

NASA PIA00452 & PIA02228
Earth seen from the orbit of Saturn

“We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.”

T. S. Eliot, Four Quartets: Little Gidding (1942)
“There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.”

Charles Darwin, 1859
On the Origin of Species
(first edition)