Seeking God in Einstein’s Universe
The Children of Earth

Aileen A. O’Donoghue
God's Grandeur

THE WORLD is charged with the grandeur of God.
It will flame out, like shining from shook foil;
It gathers to a greatness, like the ooze of oil
Crushed. Why do men then now not reck his rod?
Generations have trod, have trod, have trod;
And all is seared with trade; bleared, smeared
with toil;
And wears man's smudge and shares man's smell:
the soil
Is bare now, nor can foot feel, being shod.
And for all this, nature is never spent;
There lives the dearest freshness deep down
things;
And though the last lights off the black West went
Oh, morning, at the brown brink eastward,
springs—
Because the Holy Ghost over the bent
World broods with warm breast and with ah!
bright wings.

Gerard Manley Hopkins
Star Birth Region

Great Nebula in Orion

Giant, hot, young stars illuminate nebula

Thick, dusty disks protect forming stars & planetary systems
Interstellar cloud fragments collapse under gravity to form stars.
Products Of Stellar Fusion

★ Early universe was 75% H, 25% He

All other elements are the products of stars!
Substance of Life

★ Life requires H, C, O, & N

☉ All elements of life came from stars that lived AND DIED before the sun formed.

☉ Sun is a 2nd or 3rd generation star
　☉ 1st stars were pure hydrogen and helium)

“We are the matter of the cosmos contemplating itself.”

- Carl Sagan
Planetary Nebulae

☆ The source of common heavy elements (lighter than iron) ... C, O, N, Ca, K, P, etc.
Iron

Iron is the most stable element
- ABSORBS energy in fusion
- ABSORBS energy in fission

When iron core begins to fuse
- energy is absorbed by reaction
- core cools ... contracts
- outer layers begin to fall in
- star implodes ...
  - outer layers bounce off dense inner core
- star explodes ...
Supernova
Crab Nebula
Supernova Observed in 1054 by Chinese & Anazazi

Capella in Auriga
Castor in Gemini
Pollux in Gemini
M1
Rigel in Orion
Sirius in Canis Major
Procyon in Canis Minor
Aldebaran in Taurus

Aldebaran in Taurus
Capella in Auriga
Rigel in Orion
Procyon in Canis Minor
M1
Sirius in Canis Major

M1
Rigel in Orion
Sirius in Canis Major
Procyon in Canis Minor
“... Bathe yourself in the ocean of matter; plunge into it where it is deepest and most violent; struggle in its currents and drink of its waters.

“For it cradled you long ago in your preconscious existence; and it is that ocean that will raise you up to God.”

Teilhard de Chardin
The Milky Way Galaxy

Sun ~ 30,000 ly from center
Galactic Year ~225,000,000 yr (Sol is ~22)

M87, a galaxy much like the Milky Way

Solar System

Stars & Planets formed from interstellar clouds collapsing under gravity
Earth

☆ Active, living planet

▷ Layered

▷ Molten inner core
  ✎ creates magnetic field required for land life!

▷ Plastic mantle
  ✎ drives plate tectonics
  ✎ powers volcanoes

▷ Crust
  ✎ Constantly evolving

▷ Biosphere
  ✎ Hydrosphere
  ✎ Atmosphere
Earth's History
New York’s History

★ Tectonic map shows history
New York’s History

☆ Oldest rocks: Canada & the Adirondacks

☆ Canadian Shield: Superior
  - Volcanic & Granitic rocks from 2.7 - 3.5 by ago
  - Metamorphosed ~ 2.7 by ago

☆ Canadian Shield: Grenville
  - Outwash from original N. American Continent > 1 BY ago
  - Metamorphosed ~ 1 By ago in Grenville Orogeny

☆ Sedimentary outwash from Canadian shield, tectonically passive
New York’s History

★ Compressed rocks: Taconic Orogeny
- Closing of Iapetus Ocean
- Collision with Baltica & Avalonia (Island)

★ Marine Sediment from Iapetus Ocean

★ Taconic Mountain roots
- metamorphosed Grenville rocks
- Taconic Mts. ≈ Himalayas

★ Gander Terrain
- Pieces of N. Europe (Baltica) added during collision

★ Avalonia Terrain
- Island added during collision
New York’s History

☆ Compressed rocks: Acadian Orogeny
- Asia collides with Siberia creating Urals
- Siberia collides with Baltica & N. America

☆ Gander Terrain
- Further deformation

☆ Intrusions
- Igneous & Metamorphosed granites

☆ Avalonia Terrain
- Further deformation
New York's History

★ Compressed rocks: Alleganian Orogeny
   ◇ Africa & S. America collide with Am.

★ Gander Terrain
   ◇ Further deformation

★ Intrusions
   ◇ Igneous & Metamorphosed granites

★ Avalonia Terrain
   ◇ Further deformation

★ Appalachian Mountains
   ◇ Due to collision with Africa
New York’s History

☆ Stretched rocks: Birth of Atlantic
  ◆ Breakup of Pangea
  ◆ Rifting of NE N. Am. From Europe

☆ Plutons
  ◆ Upwelling of molten rock from mantle during rifting
  ◆ eg. White Mountains of NH

☆ Rift Basins open
  ◆ Connectic River Valley
  ◆ Newark Basin
  ◆ Undersea Basins
New York’s History

★ Gouged & Piled rocks: Glaciation
   • Mohawk & Hudson Valleys Carved out
   • Long Island created from glacial till

★ Terminal Moraine
   • Farthest extent of glaciation
   • Jumbled sediments
     » Not sorted by size

★ Canton/Potsdam area
   • Under glaciers
   • Under Lake Iraquois
     » Ice dam blocked St. Lawrence outlet
   • Under Champlain Sea
     » Sea intruded after ice broke
     » Receded as continent rebounded
New York's History

★ Current landscape a snapshot

 управ Taconic Mountains

▷ were higher than Himalayan mountains
  ❁ same origin: colliding continents

▷ have eroded completely
  ✿ Taughannock Falls cutting Taconic sediments!
Earth’s History

★ 4.6 Billion Years

♫ Oldest Material 4.0 – 4.2 Billion years old
   ♫ Zircon crystals in W. Australia

♫ Oldest Rocks 3.7 – 3.8 by
   ♫ Iron Mountain, Greenland

♫ Oldest Fossils
   ♫ Microscopic: 3.5 by
      ♫ Stromatolites (bacterial colonies)
   ♫ Macroscopic: 650 my
      ♫ soft-bodied organisms
Mass on the World

“... Over every living thing which is to spring up, to grow to flower, to ripen during this day say again the words: This is my Body.

Teilhard de Chardin
Life's History

Earth is 4.5 by old

Now

Then

Earliest life 3.5 by ago: stromatolites (cyanobacteria)
Life At High Temperature

Hot Springs in Yellowstone National Park

Cyanobacteria ... the most ancient life on Earth
Life In The Dark

The Deep Sea Vents

Life utilizes minerals from Earth’s interior
Life’s History

Evolution of complex life only in last 650 million years!

Most evolution has taken place ONLY in last 14% of the age of Earth!

Most evolution has taken place ONLY in last 5% of the age of the universe!
Abundance Of Life

Life survives in every ecosystem on Earth ... even within ice and rocks!

Sulfide-digesting bacteria on rocks

Microbe from Antarctic Ice
Abundance of Life

Life fills the air

Sandhill Cranes, Bosque Del Apache, Socorro, NM

The last of the dinosaurs!
Life Everywhere On Land
Life From The Rocks

Lichens: symbiotic associations of algae and fungi

Shrub on the desert pavement
Trees From The Rocks
Life On The Trees
Given Hydrogen, Gravity & 15 Billion Years The Universe Made

Puppies!

Kiva

Pace

Puppies!
Touching Earth

Whenever your feet touch Earth you know they are touching Where something has died or been born.

Antler
Earth Prayers
And All Is From The Stars!

Giant stars produced Fe, Zn, Au, Ag, Hg, Pb, I, Ba ...

Sun-sized stars produced C, O, N …

Except the hydrogen which is from the first millisecond after the Big bang!
The Divine Dance

“There are only two ways that people really have new experience. Most things we call experiences are things that are just repetitions and we imprison them inside experience we already have... so most people stop growing after 17 or 18.
Wonder as the Spiritual Path

“There are two ways we can break through and have new experience ...

Awe or Wonder where your logic breaks down. At that point you can have new experience. Otherwise you will just fit everything into your old experience and it will just be repetition.
Wonder as the Spiritual Path

“Awe and wonder are co-relative terms with mystery ... When you have to remain in the humility of wonder and awe before mystery, that’s when God can break in with new experience. And you can never say “I know” or “I’ve got it in a package.”

Fr. Richard Rohr, OFM
But Wait! Don’t Order Yet …

Meteors have wiped out up to 90% of life on Earth …

A nearby supernova would destroy life on Earth with radiation …

★ The sun becoming a red giant will destroy life on Earth …
The Very Wonders Kill

★ The universe is not always gentle
- meteors kill
- volcanoes kill
- solar radiation kills
- animals must kill to live
Genesis

"God saw everything he had made, and indeed, it was very good. And there was evening and there was morning, the sixth day."

But what about roadkill?
Even Roadkill Is Star Stuff!
Roadkill: Inadvertent Death

“The Earth is full of your creatures”
Roadkill

Life is so abundant ...

We can waste it

And make fun of it.
Is God Present in Roadkill?

☆ Inadvertent, wasteful death

☆ Caused by the gifts of metals, machines and minds.
Coping with Roadkill

☆ What can we do about roadkill?
   ◆ stop driving?
   ◆ drive slower?
   ◆ elevate all roads?
   ◆ drive hovercraft?

☆ As we work to reduce & eliminate it,
   ☆ can we acknowledge and bless it?
   ☆ Can we include it in the Christic Universe?
“The concern here is with the possibility of a theology of nature, that is, using the picture of reality coming to us from postmodern science as a way to reimagine the relationship between God and the world.”

Sally McFague
The Body of God
Reducing/Eliminating Roadkill

“...to consider ourselves as inspired bodies, profoundly interrelated with all other such bodies and yet having the distinction of shared responsibility with God for the well being of our planet.”

Sally McFague
The Body of God
Acknowledging Roadkill

"Written into the very fabric of evolutionary E-mergence, at the cosmic, planetary, and human levels, is this paradox of creation and destruction."

Diarmuid O'Murchu

Evolutionary Faith
Suffering as the Spiritual Path

“The other forum in which we have new experience is suffering. Suffering is the only thing strong enough to break down your control systems, your explanation systems, your logic systems, your being in charge and your being in control.”
Suffering as the Spiritual Path

“God normally has to lead your mind or your intellect to the limits of its resources. Or your will where ‘I cannot do it!’ Your will has to fail you or intellect has to fail you, ‘I can’t figure it out. I can’t make sense of it. I can’t get through this day.’”

Fr. Richard Rohr, OFM
Blessing Roadkill

“My communion would be incomplete – would, quite simply, not be Christian – if, together with the gains which this new day brings me, I did not accept, in my own name and in the name of the world, ...
Blessing Roadkill

“... as the most immediate sharing in your own being, those processes, hidden or manifest, of enfeeblement, of aging, of death, which unceasingly consume the universe.”

Teilhard de Chardin

The Mass on the World
The Wonder Of Roadkill

“...yet not a single sparrow falls to the ground without your Abba God’s knowledge.”
Mass on the World

“... Over every living thing which is to spring up, to grow to flower, to ripen during this day say again the words:

This is my Body.

Teilhard de Chardin
Finding God In Roadkill

“And over every death-force which waits in readiness to corrode, to wither, to cut down, speak again your commanding words which express the supreme mystery of faith:

“This is my Blood.”
Loving God

“Matter and spirit: these were no longer two things, but two states of one and the same cosmic stuff.”

 Teilhard de Chardin
Seeking God in Einstein’s Universe

“All that I have written seems to me like straw compared to what has now been revealed to me.”

- Thomas Aquinas

“Anybody who knows is humble. Anybody who knows, what they largely know is that they don’t know. That’s the main thing you know when you’re talking about God is that you don’t know.”

Fr. Richard Rohr, OFM
The adventure continues ...

Background photo “Water Lily Pads in the Osgood River” by Bob Lepak