Believing in Everything?

Exploring God’s World of Endless Wonder
or
Exploring the Wonder of God’s Endless World?
Anything and Everything

A theory of everything* is not the same as a theory of anything.

A God who can do anything* is not the same as a god that does everything.
Anything and Everything

A theory of everything* is not the same as a theory of anything†

A God who can do anything* is not the same as a god that does everything‡

*A (reductionist) description of all that physically does and might exist

† A (reductionist) assertion that all that might exist does physically exist

‡ A creator capable of instantiating any self-consistent reality

§ An agent that instantiates all possible self-consistent realities
Cosmic Theology

- Afterglow Light Pattern 400,000 yrs.
- Dark Ages
- Development of Galaxies, Planets, etc.
- Dark Energy Accelerated Expansion
- Inflation
- Quantum Fluctuations
- WMAP
- 1st Stars about 400 million yrs.
- Big Bang Expansion 13.7 billion years

Injection → Direction → Selection
Is Our Universe Typical?

Doesn’t appear to be typical
Anthropic Accolade

• We can only live in a universe whose
  – Laws (constants of nature) permit our kind of life
  – Structure (planets, water) permits our kind of life
  – Initial conditions (entropy, expansion) allowed our kind of life
  – Obvious when you think about it

• Life needs SPECIAL PERMISSION
  – Laws, structure and initial conditions are all special
  – Biophilic parameter range is NARROW, not broad
  – Not obvious -- discovered over the last 50 years

• Out of all possible universes, ours is NOT TYPICAL

\textbf{Why?}
The Puzzle of Potentiality

Standard Paradigm

• Many potentialities
  - Physics describes (a) the actual system and (b) the possible things a system can do
  - Does NOT mean that all the possible things are actual (materially) existing things/events

• One actuality

What is actualized depends on
a) underlying laws (symmetries, dynamics)
b) boundary conditions (set by agent and/or environment)
From the Potential to the Actual

- Many potentialities
- Systems seek out
  - lowest energy
  - largest entropy
  - maximal stability

• One actuality

Hydrogen Atom

\[
\begin{align*}
n &= 1 & m &= 0 \\
\ell &= 0 & m &= 0 \\

n &= 2 & m &= 0 \\
\ell &= 1 & m &= 0 \\
n &= 7 & m &= 1 \\
\ell &= 2 & m &= 1
\end{align*}
\]

• Crucial role of agency is tacitly ignored
  - Agency used as needed
    - a) In setting up experiments
    - b) In making observations
    - c) In applying the science

D. Manthey http://www.orbitals.com/ orb/ ov.htm
Cosmological Actuality

Role of special conditions?

- Arbitrary without reason?
  - Result of Natural Law(s)
    - governing dynamical evolution?
    - determining initial conditions?
  - Result of Agency?
    - causal link between intention and action?
  - Result of Statistics?
    - inevitable due to all possibilities being actualized?
    - typical within observer-permitting universes?
Why a Multiverse?

• Frustration with Standard Science
  – Natural law, symmetry, dynamics are not working as hoped
• Agency viewed as a “science stopper”
• Bottom-Up Evidence
  – Cosmic Fine tuning
  – Biophilic Selection
• Top-Down Mechanisms
  – Cosmic Inflation
  – String Theory
Does Everything Exist?

Warning! Everything means EVERYTHING! ….doesn’t it?
Science in the Multiverse

• Framework
  – What principles guide its construction?

• Counting
  – What counts as a universe? How are universes counted?

• Typicality
  – What is a typical universe? How and why?
What’s the Framework?

- All allowed properties of liquid water molecules realized
- Randomly selected molecule should exhibit typical properties
- All allowed properties of universes realized
- Randomly selected universe should exhibit typical properties
5 Levels of Multiverse

Level 1: All possible initial conditions (inflation)

Level 2: All possible laws of physics (string theory)

Level 3: All possible outcomes (quantum mechanics)

Level 4: All possible logical structures (mathematics)

Level 5: Computer simulation (oops!)

Max Tegmark
Framework Foibles

Everything That Does Exist

Everything Observable

Everything That Could Exist But Doesn’t
Everything That Could Exist

Everything That Does Exist!

Everything Observable
Everything That Could Exist Does Exist!

Everything Observable

Everything That Could Exist Does Exist!

Ontological Economy

Theory A

Theory B

Everything Observable

Everything That Could Exist Does Exist!

Maximal Potentiality
What counts and how?

False Vacuum
(unstable, exponentially expands)
Cosmic Inflation

- Basic idea: the universe begins in a false vacuum
- This generates a period of extremely rapid (exponential) expansion of the universe
- Universe doubles in size every $10^{-34}$ sec
- This can turn a small smooth patch of spacetime (true vacuum) in a large smooth and flat universe

Infinitely many universes nucleating from the false vacuum of the multiverse
Measurement Misery

- **Counting Universes**
  - Faster expanding universes should count more
  - Youngness paradox: False vacuum expands fastest, so many more young universes than old ones (Linde; Guth)

\[ P(13.7 \text{ Gyr}) = 10^{-60} P(13.0 \text{ Gyr}) \]

- **Counting Observers**
  - All observers (or perceptions?) should be treated equally
  - Boltzmann brains: Freak observers far more likely than bio-observers (Page)
What’s typical? Are we?

If this observer is in a typical region of the multiverse, then the physical constants in that region that he/she measures can be predicted from a statistical distribution.

Pick a random observer from the multiverse.

If you were picked at random from the multiverse, you would expect to measure a neutrino mass somewhere in the middle!

Number of true vacua

Neutrino mass (eV)

0.01 0.05 1.00

0.1% 2.1% 34.1% 34.1% 13.6% 2.1% 0.1%

= biophilic universe
Mediocrity Strategy

• Consider constants of nature that are bio-irrelevant
• Do these fall within 1σ of the mean of a normal distribution?
• If most do -- multiverse?

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<th>Meaning</th>
<th>Definition</th>
<th>Measured value</th>
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<td>Weak coupling constant</td>
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<td>Weinberg angle</td>
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<td>Quadratic Higgs coefficient</td>
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<td>CP-violating QCD vacuum phase</td>
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Typicality Trouble?

- Many potentialities
- One actuality

Given the data, what's the theory?

\[ P(T_K | D) = \frac{P(D | T_K)}{\sum_L P(D | T_L)} \]

Given the theory, what's the data?

\[ P(T_1) = \sum_P P(T_1 | P) = \frac{1}{3} \]
\[ P(T_2) = \sum_P P(T_2 | P) = \frac{2}{3} \]
\[ P(T_3) = \sum_P P(T_3 | P) = 0 \]
Typicality Trouble?

- Many potentialities
- One actuality

$$P(T_K | D) = \frac{P(D | T_K)}{\sum_L P(D | T_L)}$$

Given the data, what's the theory?

Given the theory, what's the data?

$T_1$

or

$T_2$

or

$T_3$

$P(\bigcirc | T_1) = \frac{1}{2}$

$P(\bigtriangledown | T_1) = \frac{1}{2}$

$P(\bigtriangleup | T_1) = 0$

$P(\bigcirc \text{ or } \bigtriangledown \text{ or } \bigtriangleup | T_1) = 0$

$P(T_1 | \bigcirc) = \frac{\frac{1}{2}}{1 + \frac{1}{2} + \frac{1}{1000}} \approx 1/3$

$P(T_2 | \bigcirc) = \frac{1}{1 + \frac{1}{2} + \frac{1}{1000}} \approx 2/3$

$P(T_3 | \bigcirc) = \frac{\frac{1}{1000}}{1 + \frac{1}{2} + \frac{1}{1000}} = 1/1501$

$P(\bigcirc | T_2) = 1$

$P(\bigtriangledown | T_2) = 0$

$P(\bigtriangleup | T_2) = 0$

$P(\bigcirc \text{ or } \bigtriangledown \text{ or } \bigtriangleup | T_2) = 0$

$P(T_2 | \bigcirc) = \frac{1}{1000}$

$P(T_2 | \bigtriangledown) = \frac{599}{1000}$

$P(T_2 | \bigtriangleup) = \frac{2}{5}$

$P(T_3 | \bigcirc) = \frac{1/1000}{1 + \frac{1}{2} + \frac{1}{1000}} = 1/1501$
Given the data, what’s the theory?

\[ P(T_K | D) = \frac{P(D | T_K)P(T_K)}{\sum_L P(D | T_L)P(T_L)} \]

What’s the chance the theory is correct?

\[ P(D, H | T_K) = \sum_j \frac{H}{H + J} P(D, H, J | T_K) \]

Which observer is typical?

\[ P(\text{human}) = \frac{H}{H + J} \]

\[ P(\text{jovian}) = \frac{J}{H + J} \]

Theories predicting atypical humans (lots of J’s) are DISFAVoured

Selection Fallacy!
Copernican Conundrum

- Test theories using all possible data (from $H$ and $J$)
- Reason as though you are a randomly selected (bio)-observer in the multiverse

$P(\text{human}) = \frac{H}{H + J}$

$P(\text{human}) = \frac{1}{N}$

Humans typical

Humans atypical

Selection Fallacy!
Theology of the Multiverse

Why is there something instead of nothing?

Creatio ex Nihilo

Why is there something instead of everything?

Creatio ex Omnia

Purpose

Love

Theodicy

Justice

Creation

What do these mean in a multiverse?
Creatio Ex Nihilo

God creates the universe for a purpose

Isaiah 45:18
Creatio Ex Omnia

No Telic Selection!

1-1 Correspondence between God’s thoughts and God’s actions

What function does God serve?

Is there an ontological argument for the existence of the multiverse?
Creatio Ex Nihilo+Omnia

Telic Selection, but at the most remote level possible

What involvement does God have in each U?
Creativity or Chaos?

Creativity from (mindless) repetition?
Christology Conundrum

Jesus Dies on The Cross

Warning! Also a SETI Problem

Jesus Rejects Cross
Belief in Everything?

A theory of everything* is not the same as a theory of anything*

A God who can do anything* is not the same as a god that does everything*

Is the atypicality of our biophilic universe telling us something?
Where Next?

I am the way and the truth and the life. No one comes to the Father except through me.

John 14:6

Jesus affirms a single universe

In my Father's house are many rooms; if it were not so, I would have told you.

John 14:2

Jesus affirms a multiverse
Ingredients for a Theistic Cosmos

Teleology

Science

The overseer

Morality