ARE WE JUST A SPECK IN THE UNIVERSE?

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Materialism

"The Cosmos is all that is, or ever was, or ever will be."

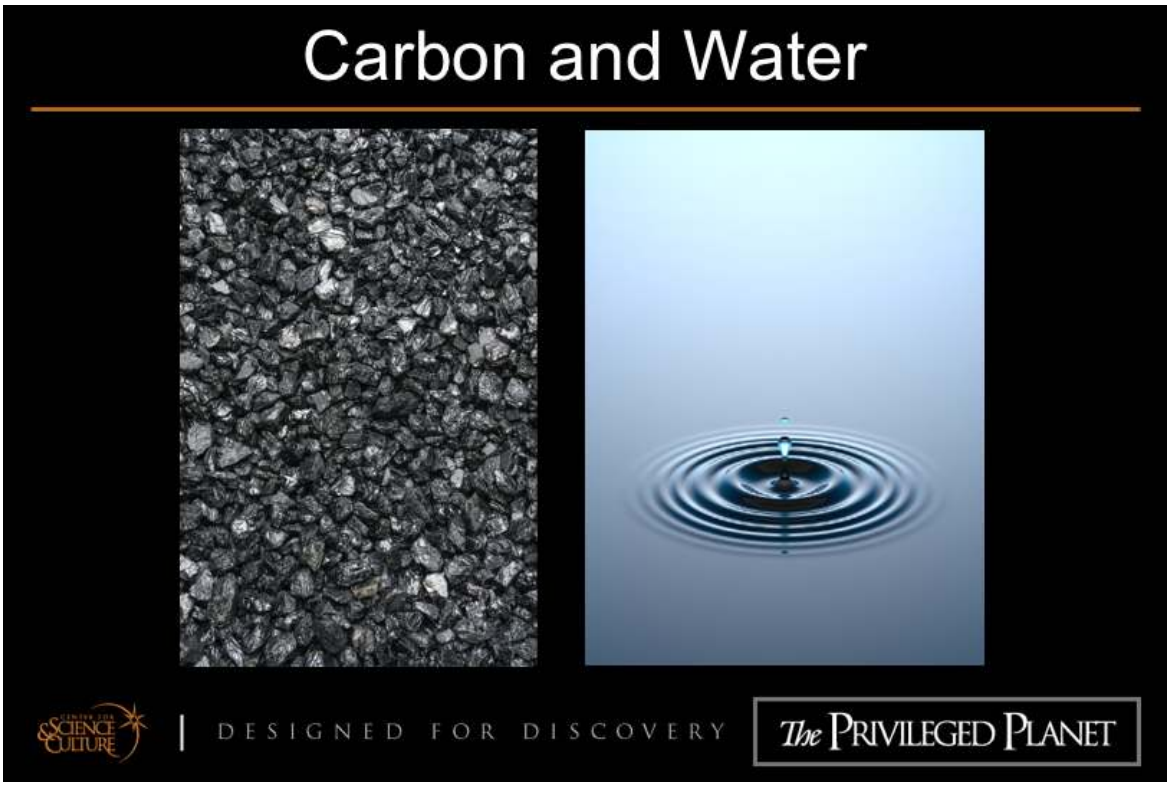
- Carl Sagan

"Because of the reflection of sunlight . . . the Earth seems to be sitting in a beam of light, as if there were some special significance to this small world. But it's just an accident of geometry and optics. . . Our posturings, our imagined self-importance, the delusion that we have some privileged position in the Universe, are challenged by this point of pale light . . .

". . . Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no

hint that help will come from elsewhere to save us from ourselves.”

Are we really an insignificant speck in an impersonal universe? Do we exist for no purpose? Or is the truth otherwise?

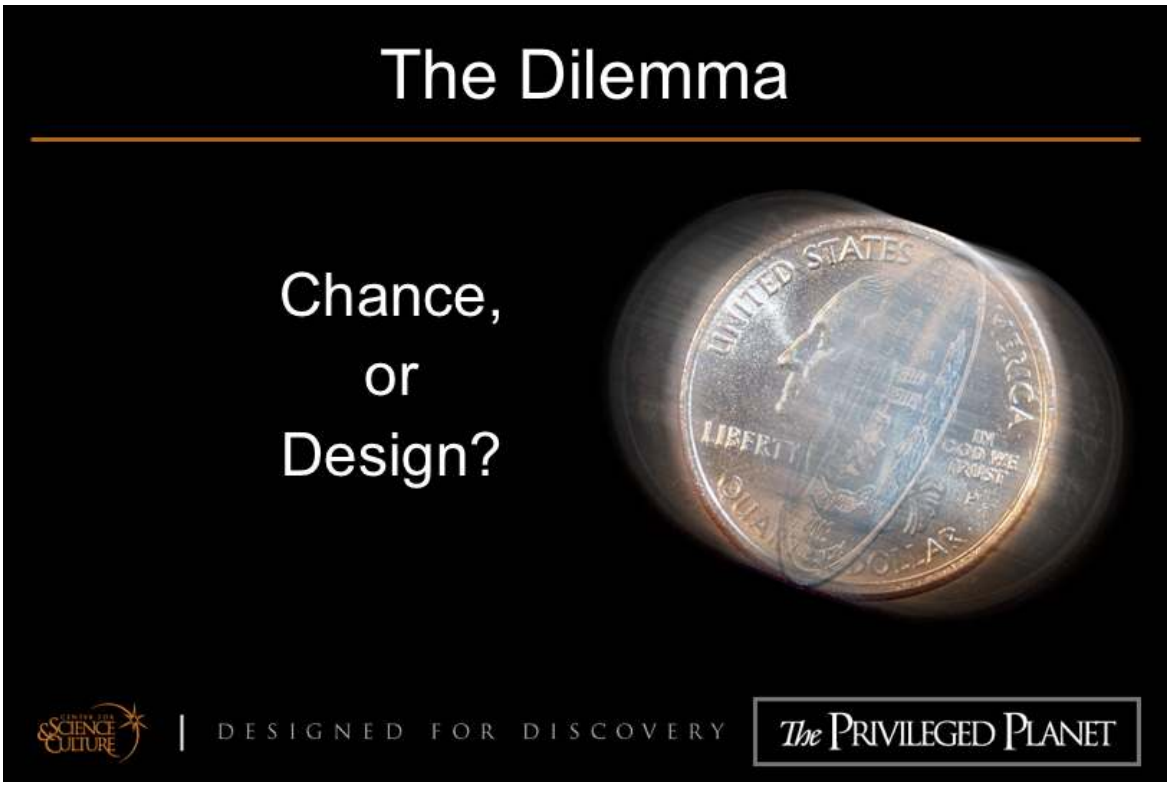


No other atom comes close to carbon in its ability to form large metastable molecules and to bond with so many other elements.

Water is liquid over just that range of temperatures at which carbon chemistry is most active.


A Habitable Planet
Liquid water
Right terrestrial planet
Stabilizing moon
Plate tectonics
Right atmosphere


A Habitable Planet
Right planetary neighbors
Right single star
Right galaxy
Galactic location
Right cosmic time



With so many probabilistic resources (a very large universe), how do we tell if a habitable planet like Earth is the result of chance or design?

0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 x 0.1 = 10^{-13}

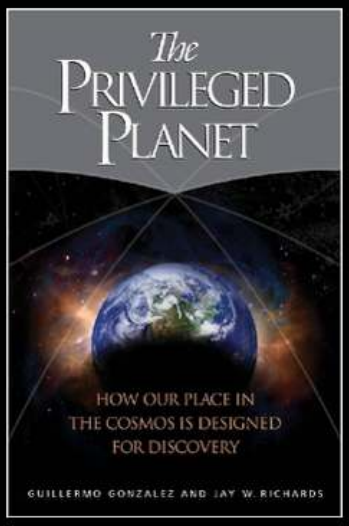
There are about 10^{11} stars in the Milky Way.

So, there's a 1 percent chance of having just one habitable planet in the Milky Way.

But, there are about 10^{11} galaxies in the observable universe.

So, chance has a lot of room to operate.

Our Argument



Habitability correlates *with* Measurability

The same narrow circumstances that allow us to exist also provide us with the best *overall* setting for making scientific discoveries.

The very conditions that make Earth hospitable to intelligent life also make it well suited to viewing and analyzing the universe as a whole.

Examples of the "Correlation"

- Perfect solar eclipses
- Layering processes
- Plate tectonics
- Transparency of atmosphere
- Planetary neighbors
- Stars
- Galactic location
- Cosmic time
- Fine-tuned cosmos

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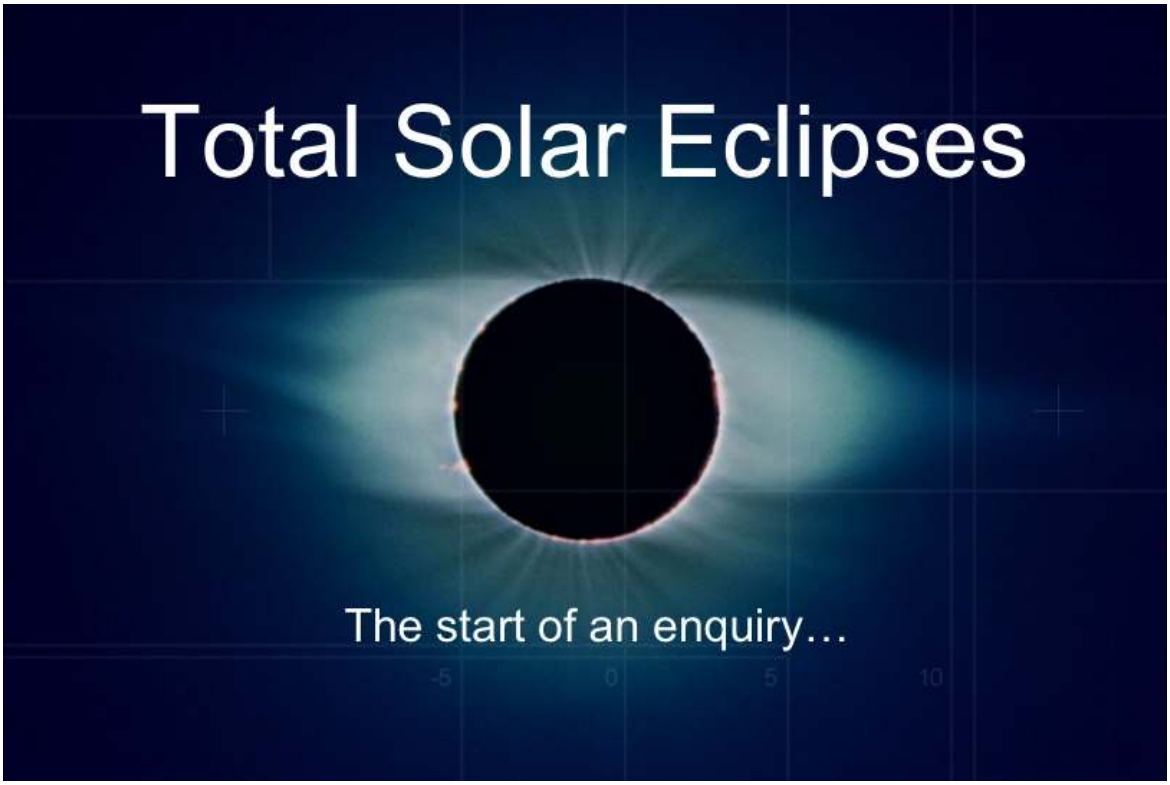
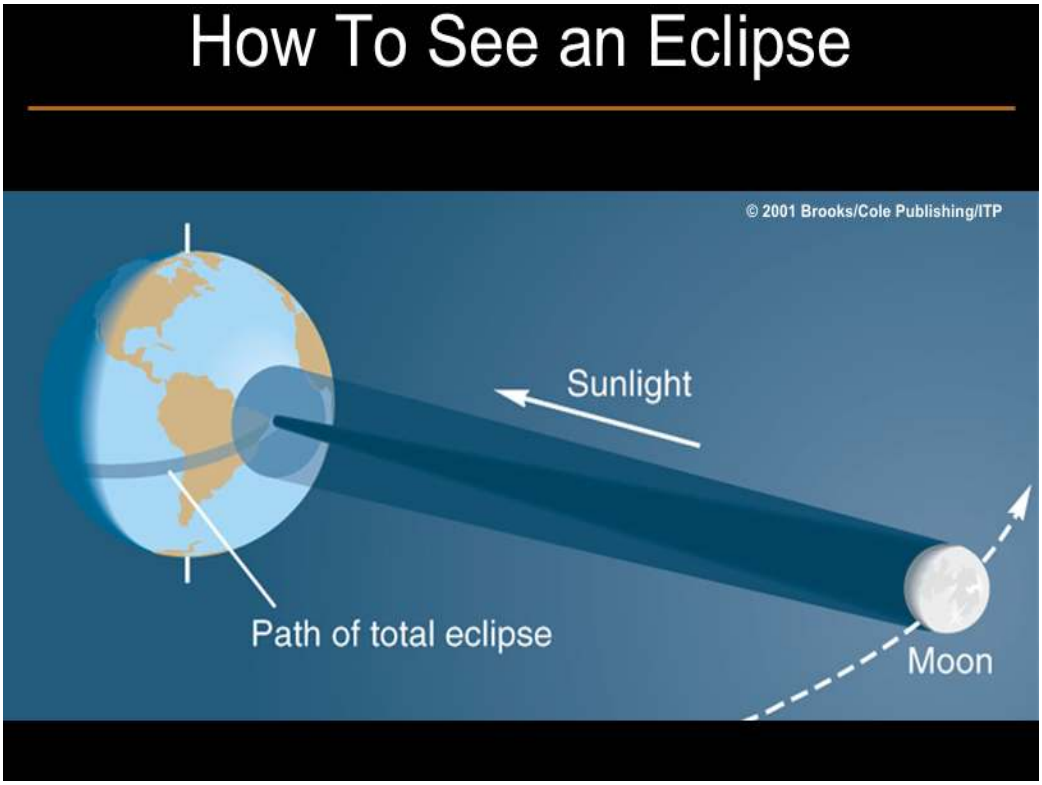
Total Solar Eclipses



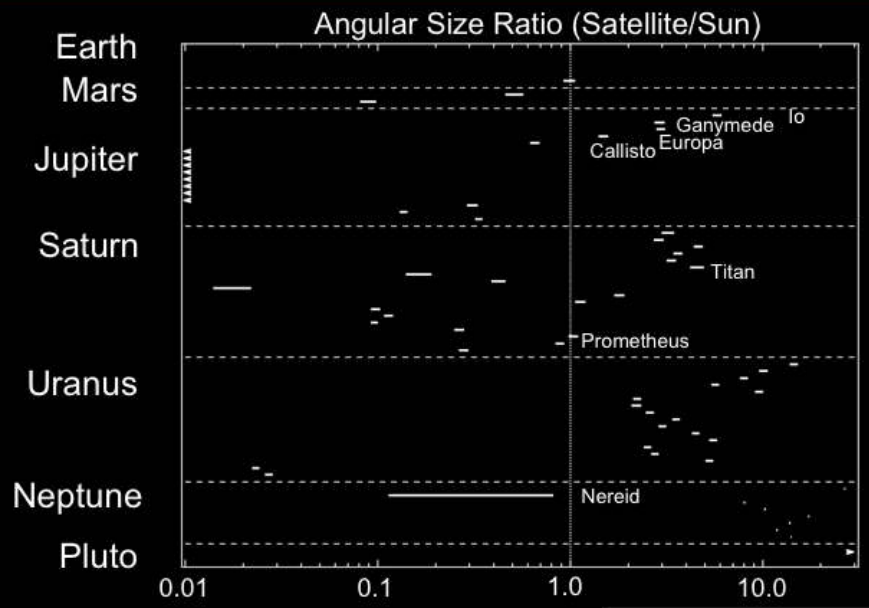
The start of an enquiry…



To produce an eclipse, you need:
A luminous body
An eclipsing body
An observer platform
The right distances apart
All in a straight line in space

The apparent size of the sun and the moon match in our sky.

Solar Eclipses in the Solar System



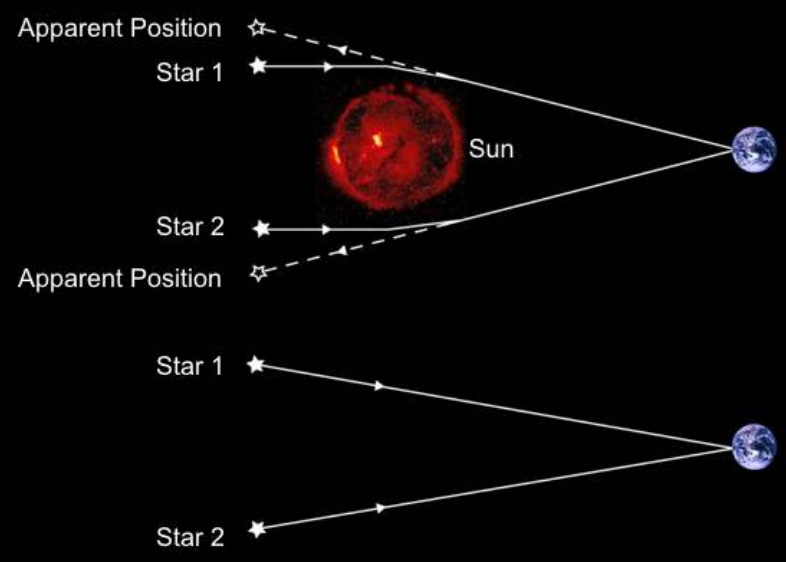
DESIGNED FOR DISCOVERY

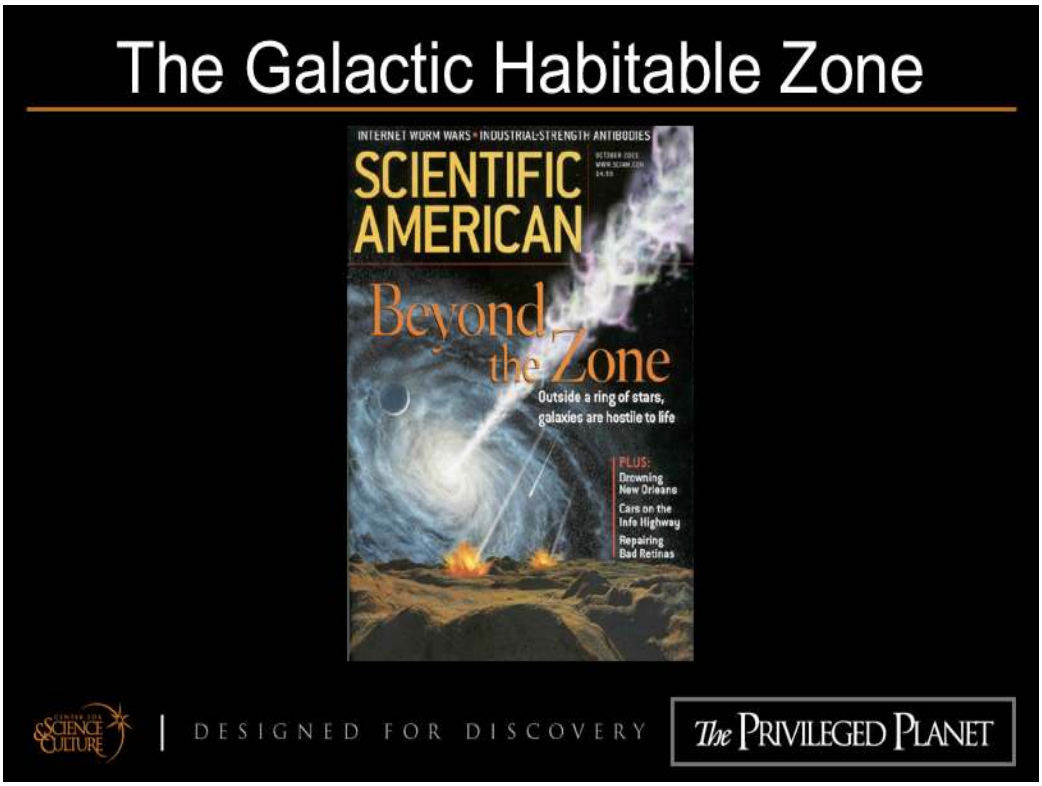
The PRIVILEGED PLANET

Eclipses are important for scientific discovery.

- Test of General Relativity
- Makes chromosphere detectable
- Helps reveal stars as hot balls of gas

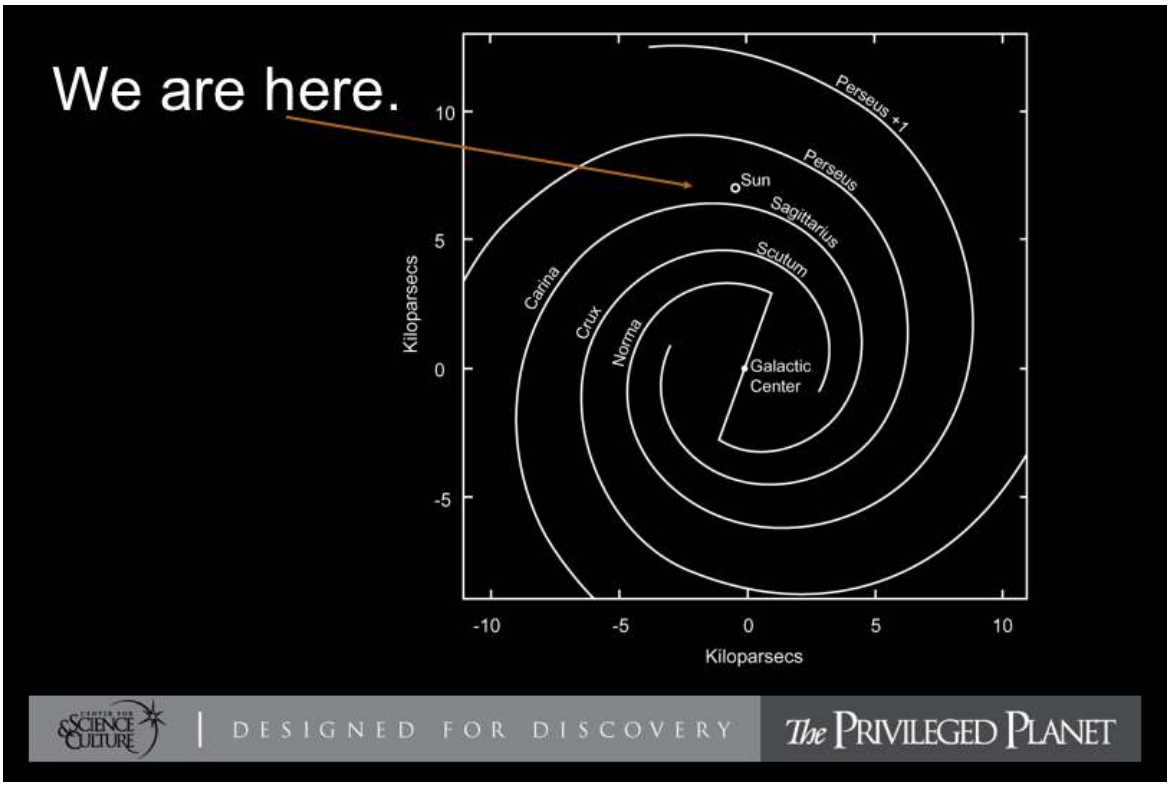
Test of General Relativity





Two broad phenomena define it:

Requirements for a habitable planet
Survival of complex life


We are here.
Perseus +1
Perseus
Sun
Sagittarius
Scutum
Carina
Crux
Norma
Galactic Center
Kiloparsecs
Kiloparsecs
10
5
0
-5
-10
-5
0
5
10
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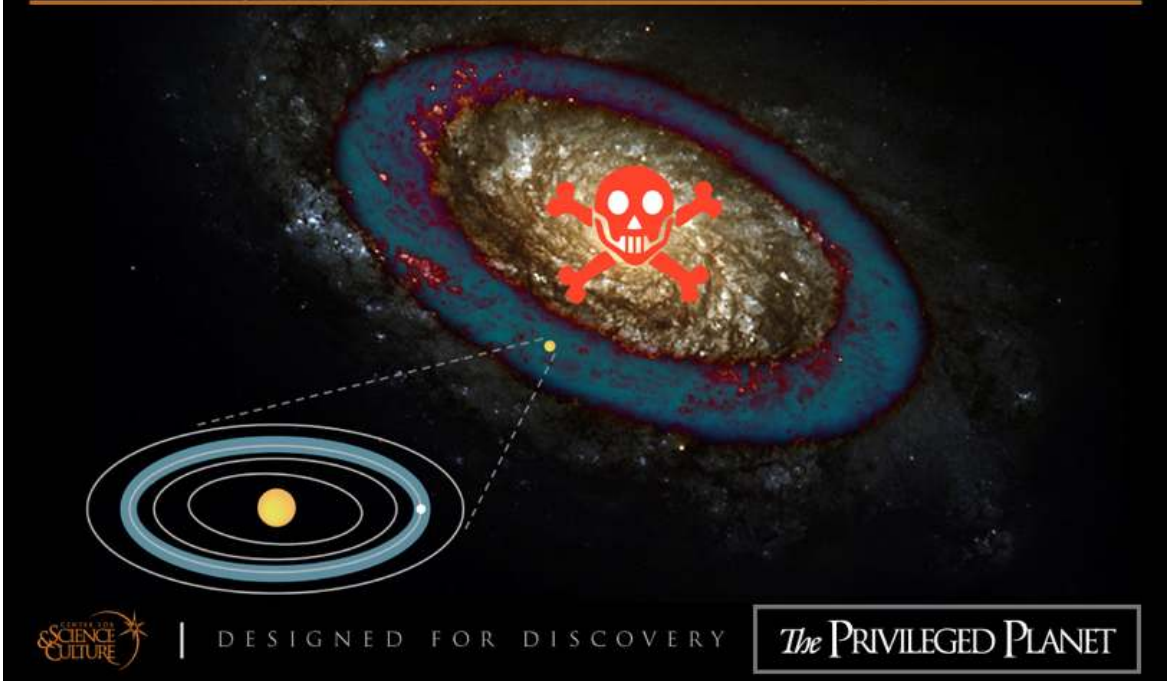
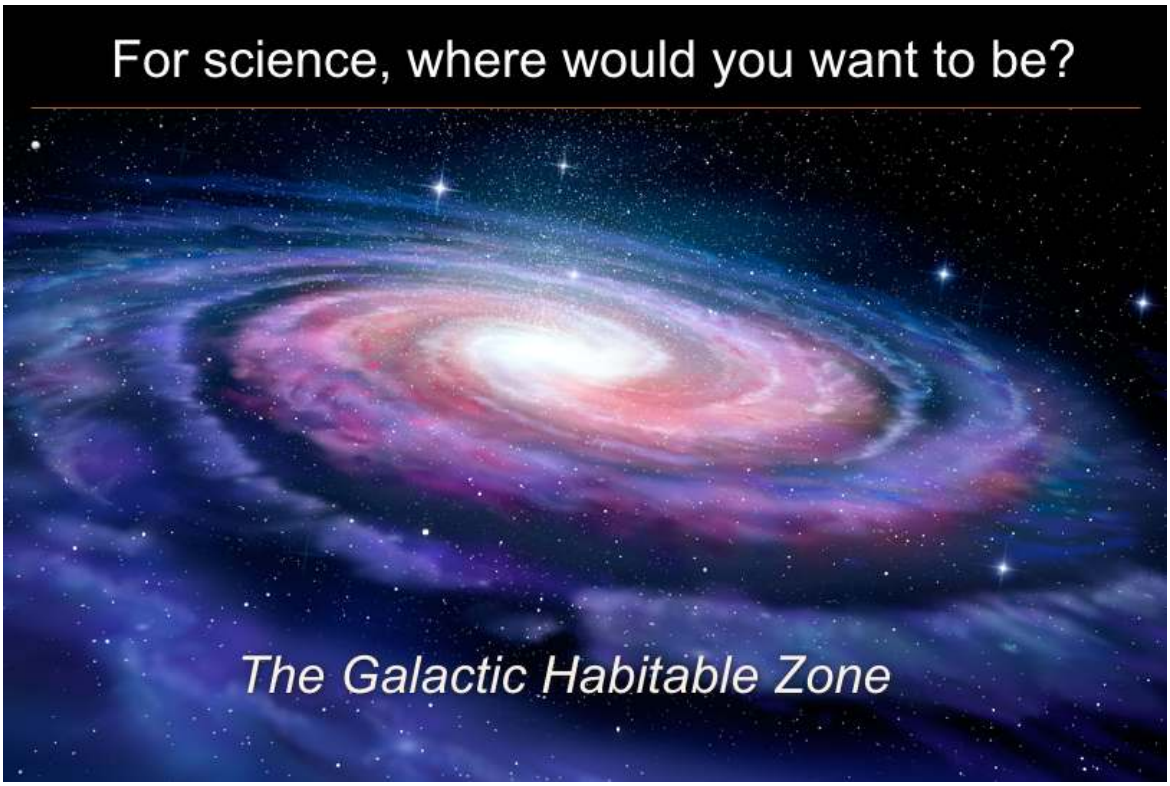
The PRIVILEGED PLANET

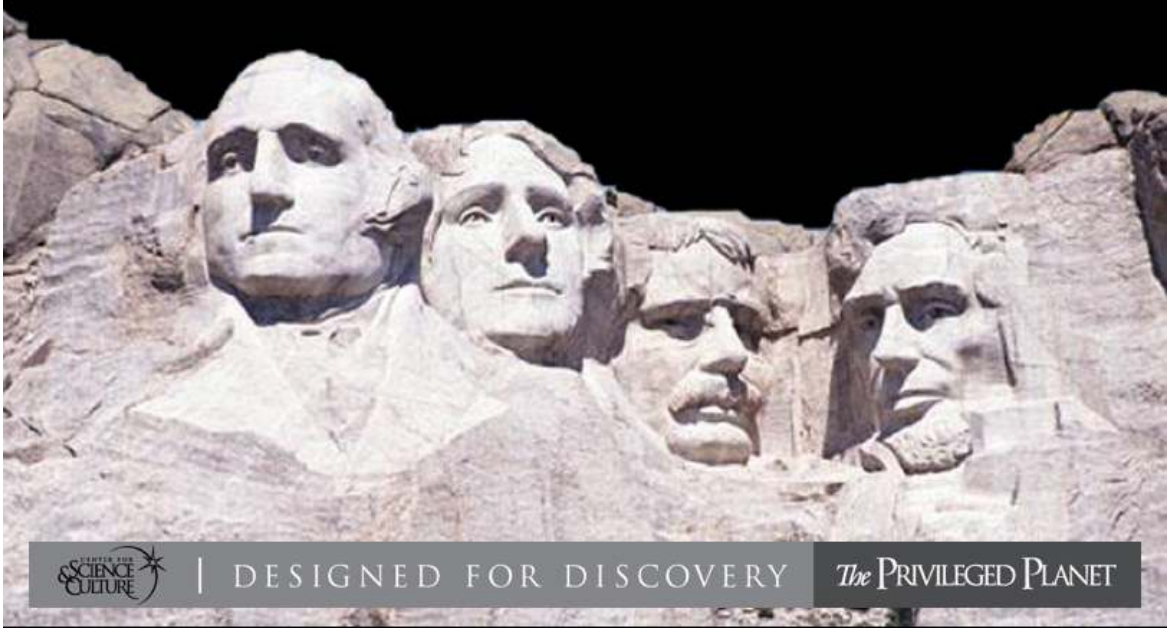
The Galactic Habitable Zone




For science, where would you want to be?
The Galactic Habitable Zone


SO
WHAT?

Detecting Design



Complexity = Improbability

- The conditions that allow for habitability are improbable.
- The conditions that allow for measurability are improbable.

Specification = a meaningful pattern

The correlation of habitability and measurability forms a meaningful pattern.

The summit of Mauna Kea is home to a dozen world class observatories. The twin Keck Telescope domes shown here each house telescopes ten meters in diameter. Each mirror is composed of 36 hexagonal segments that work in concert as a single piece of reflective glass.


A Modest Conclusion
The universe is fine-tuned so that environments habitable to observers will provide the best overall conditions for observation and discovery.

The universe is designed for *discovery*.

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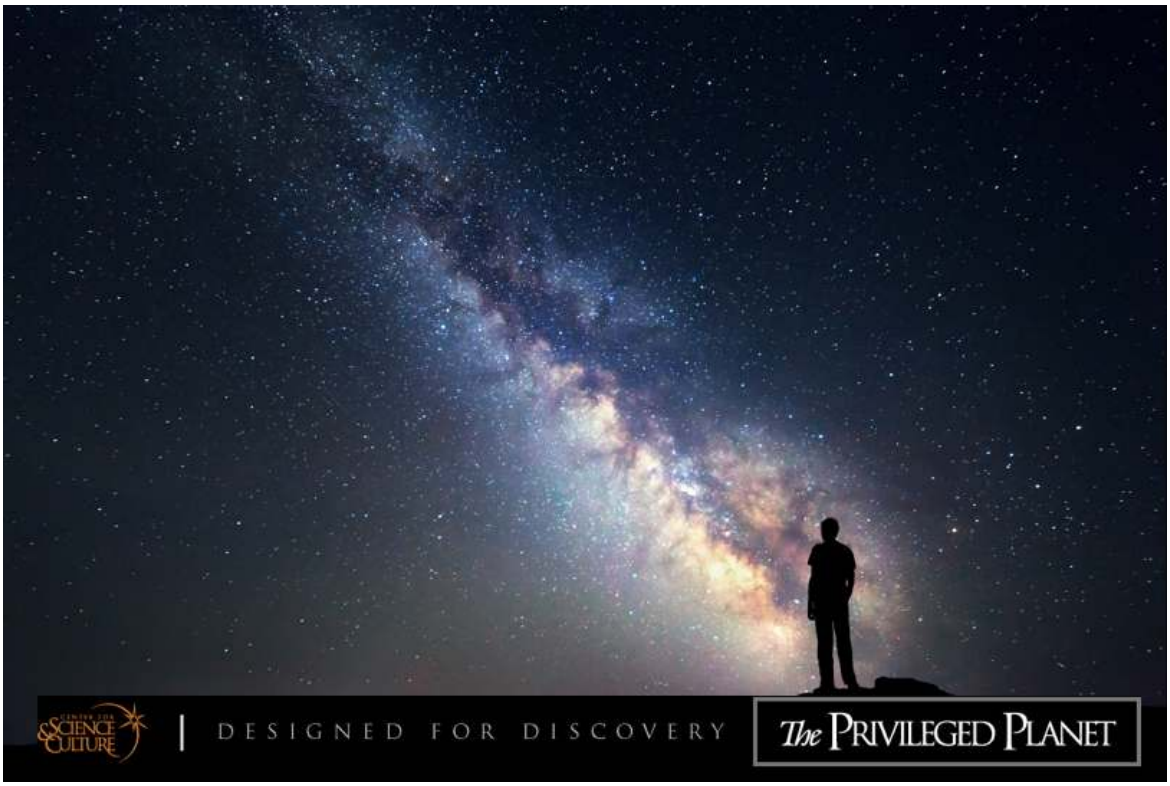
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