



Message from aliens or colliding objects? The hunt for enigmatic radio bursts is about to get real

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The Existence of Extra-Terrestrial Intelligence

The Idea Behind SETI

- ✦ Epicurus (341-270 BC).
- ✦ *....there are infinite worlds both like and unlike this world of ours. ...So that nowhere exists an obstacle to the infinite number of worlds*

Introduction

- ✦ Historical overview of SETI (pluralism=belief in other worlds)
- ✦ Show that old concepts of the Universe and old arguments influenced thinking about pluralism for a long time and still do
- ✦ Increase in knowledge through new instrumentation does not automatically lead to rejection of old hypotheses
- ✦ Show major arguments for pluralism and ETI

Main Research Question?

- Is SETI science or just the hunt for an Idea?

Antiquity

- Epicurus (341-270 BC).
 - *....there are infinite worlds both like and unlike this world of ours. ..So that nowhere exists an obstacle to the infinite number of worlds*
- Epicureanism is one of the 3 dominant rational belief systems:
 - Atomists, atoms infinite in number and extent moving freely through the void
 - Leucippus stated causality: *“Everything happens out of reason and necessity”*
 - Universe is infinite in extent and contains an infinite number of atoms (small seeds, Anaxagoras)
 - Universe was not ruled by Gods but by a universal rational Mind.

Plato: *principle of plenitude*

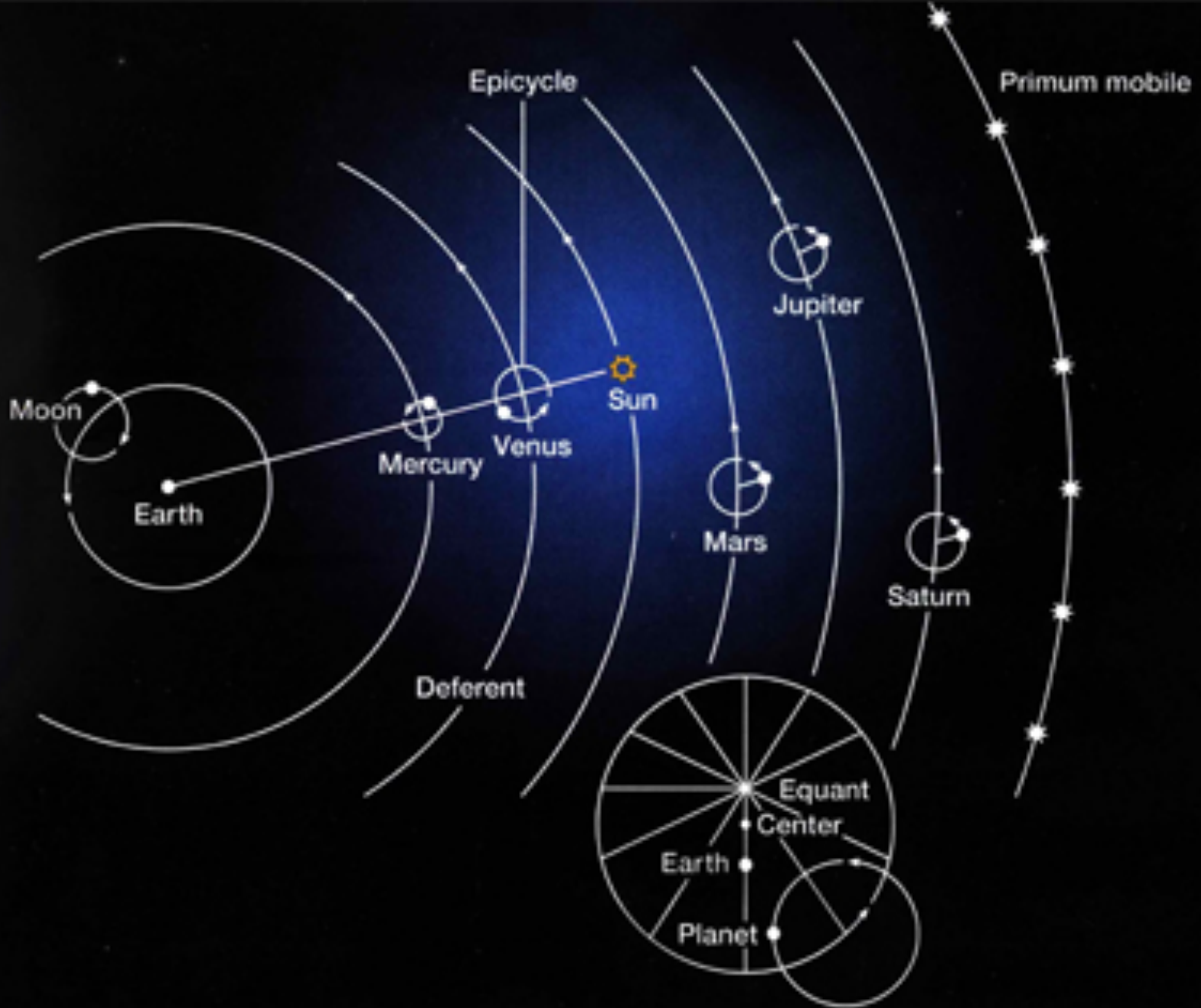
- Rejected pluralism Timaeus *“there is and ever will be one only-begotten created heavens”*
- Plato’s dualism between the world of phenomena and the world of Idea’s. The reality is in constant flux but is an image of the eternal real world of Idea’s. A world that can only be reached by the intelligent mind. *“A world of Forms over and beyond the sensible world”*
- The philosophy of Plato has influenced thinking about our Universe and Extra Terrestrial life until to date.
- The principle of plenitude is the answer of Plato to the question what determines the number of kinds of being that make up the material and temporal world.. The answer to the question concerning the number of kinds was: **all possible kinds**

Antiquity

- Aristotle's Universe (Ptolemaic Universe) (continued)
 - Based on observations
 - Earth centered (is natural given current observations)
 - 56 sphere rotating around the Earth
 - No void (as stated by Aristotles theory about motion)
 - No explanation for variation in brightness of planets

Antiquity

- Ptolemae
 - Improved Aristotle's Universe
 - Adapted the eccentricity of circles
 - Added epicycles
 - Introduced equant "equalizing point"
 - Rejected atoms, the Milky Way as an agglomeration of stars, Earth rotation
 - Abandoned the idea of perfect circular motion (p 37, Harris)



Middle Ages

- Augustine hinted on the possible plurality of worlds, not rejecting the plurality of worlds in space but in time
- Augustine also translated the Idea world of Plato to Christianity. This is a very important paradigm in Western thinking and very influential
- 219 Condemnations proclaimed in 1277 by Etienne Tempier, bishop of Paris
 - *“God’s power is without limit, is everywhere and cannot be confined to any one place”*
- Landmark in history of cosmology it replaces the God of Aristotle that could not move the Earth and could not create other worlds by a God that could create many worlds and of unlimited power.

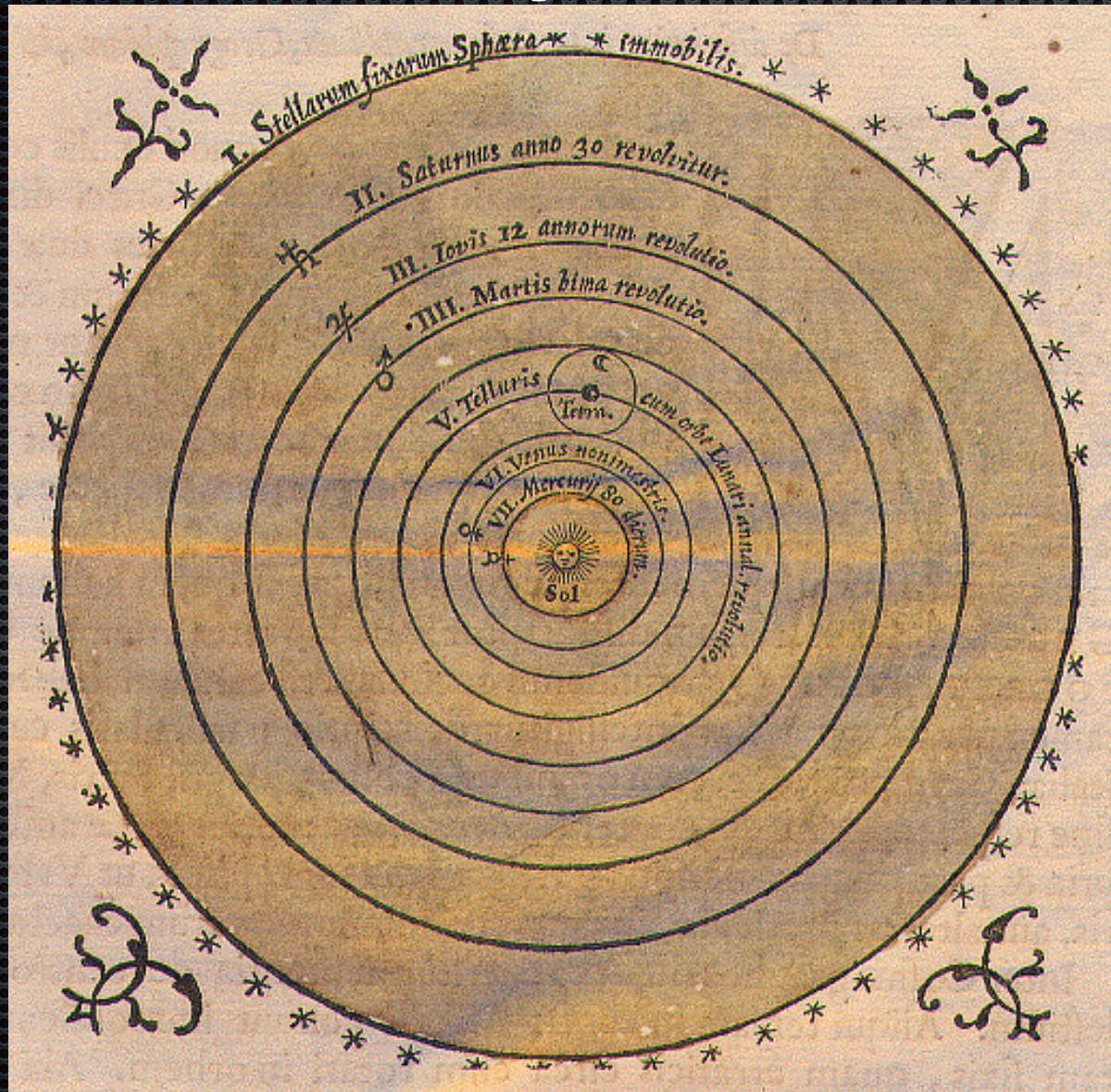
Nicolaus Copernicus (1473 - 1543)



Copernican Revolution

- Copernicus “Revolutions of the Celestial Spheres” 1543: “All orbs revolve around the Sun, taken as their center point, and therefore the Sun is the center of the Universe”
- Copernicus based on arguments from Oresme (based on Heracleides, a rotating Earths simplifies the structure of the Heavens), but his model was not as accurate as Ptolemae
- Giordano Bruno; edgeless Universe “In the Universe no center and circumference exist, but the center is everywhere” Adopted the Epicurean universe.
- Bruno was martyred for his pluralist convictions: “Thus is the excellence of God magnified and the greatness of his kingdom made manifest; het is glorified not in one but in countless Suns; not in a single Earth, but in a thousand, I say, **in an infinity of worlds**”

Copernican System



Teleological Reasoning

- Origin at Aristotle's 4 causes: *The Final Cause: "everything that has a function must exist for the sake of that function"* (Leunissen, 2007:318)
- Thomas Aquinas reinforced teleology and stated: *not accepting final causation is rejecting God* (White, 2013:16)
- Argument was widely employed to account for life on other planets without observational evidence
- Kant changed the teleological argument, he made teleology intrinsic: the forces of Nature interact with matter and in this way create stars and planets (Schönfeld & Thompson, 2014:33).

Uniformity of Nature

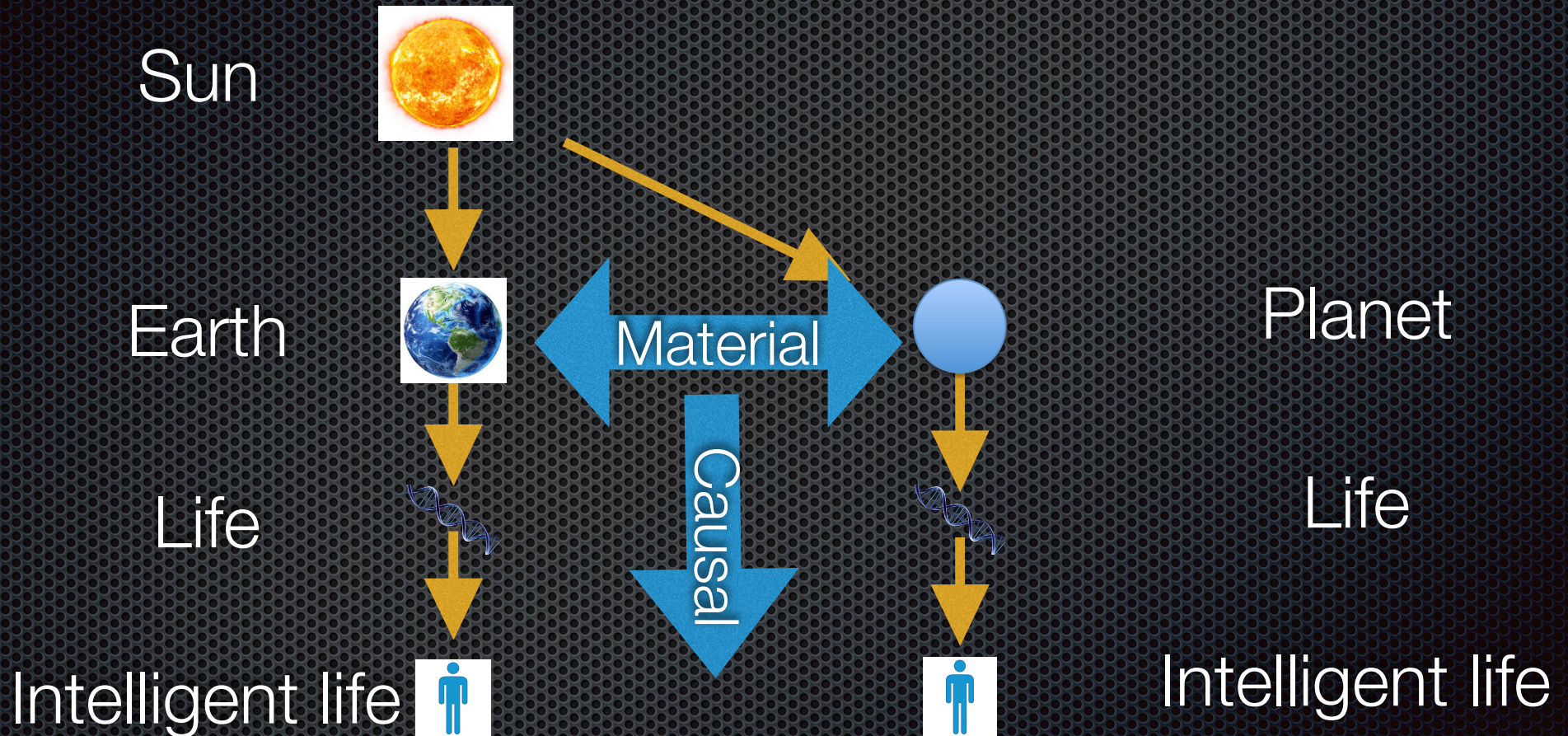
- The word “universe” has a Latin origin and is a composition of unus the Latin word for “one” and versus meaning both “against” and “to turn”, so the meaning is “to turn into one”.
- The idea of the universe is connected to the uniformity of nature, assuming the cosmic principle of a homogeneous and isotropic Universe where the laws of nature are valid in every place and time.
 - In place means natural laws will act uniformly; provided the boundary conditions are sufficiently similar, the same physical cause will produce the same effect.
 - In time means the future will belike the past; the laws of nature do not change over time.
- Uniformity of Nature was subject to different interpretations between Hume and Kant

The Great Chain Being

- Originates at Plato: 2 worlds: material reality subject to change and temporal and the world of Ideas
- The connection between the Ideas and counterparts in reality demand manifestation in concrete existences: *all possible kinds*
- *Requiring a fullness of the realization of conceptual possibility in actuality* (Lovejoy, 1933:52).
- For Lovejoy principle of plenitude is a *plenum formarum both continuous and hierarchical*
- *“The scale of being, then, as implied by the principle of expansiveness and self transcendence of “the Good,” becomes the essential conception of Neoplatonic cosmology.”* (Lovejoy, 1933:63)
- The Reverse Chain is also used in modern physics: Abducting the Universe to first principles is an influential idea even in modern physics

After Copernicus

Argument from Analogy



“The moon, say I, is inhabited because she is like the earth; and the other planets are inhabited because they are like the moon” (Fontenelle in Lovejoy, 1933:131)

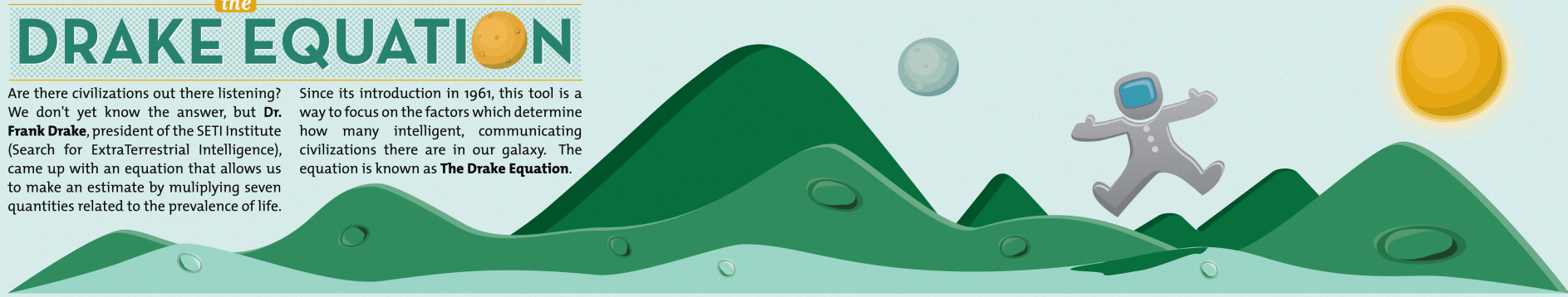
Reasoning toward Extra Terrestrial Life

- ✦ Argument from Analogy
- ✦ Teleology: in particular final causation
- ✦ Uniformity of Nature
- ✦ The Great Chain of Being

the DRAKE EQUATION

Are there civilizations out there listening? We don't yet know the answer, but **Dr. Frank Drake**, president of the SETI Institute (Search for ExtraTerrestrial Intelligence), came up with an equation that allows us to make an estimate by multiplying seven quantities related to the prevalence of life.

Since its introduction in 1961, this tool is a way to focus on the factors which determine how many intelligent, communicating civilizations there are in our galaxy. The equation is known as **The Drake Equation**.



$$N = R^* \times f_p \times n_e \times f_e \times f_i \times f_c \times L$$

N
solution

the number of civilizations in our galaxy with which communication might be possible

R*
variable

the average rate of star formation per year in our galaxy

f_p
variable

the fraction of those stars that have planets

n_e
variable

the average number of planets that can potentially support life per star that has planets

f_e
variable

the fraction of the above that actually go on to develop life at some point

f_i
variable

the fraction of the above that actually go on to develop intelligent life

f_c
variable

the fraction of civilizations that develop a technology that releases detectable signs of their existence into space

L
variable

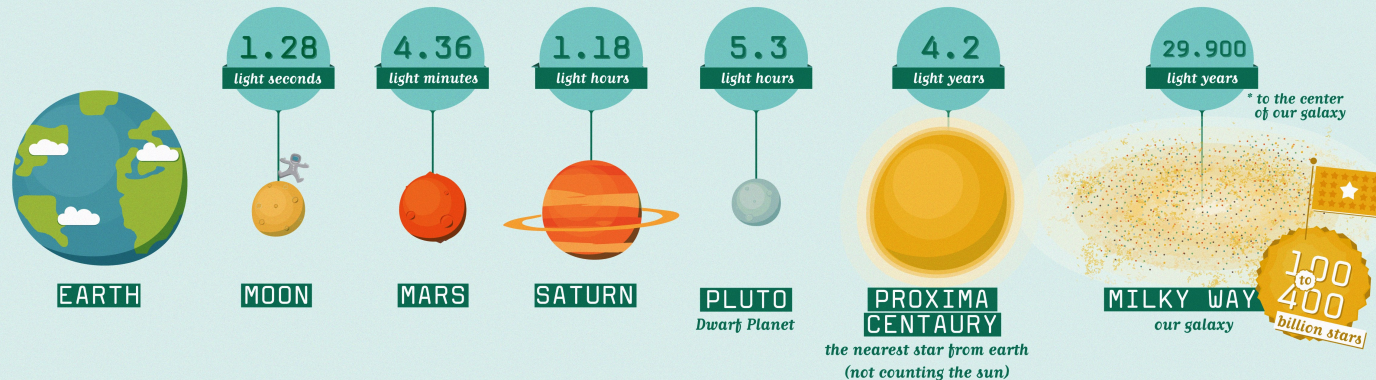
the length of time for which such civilizations release detectable signals into space

SPACE TRAVEL

in Light Distances

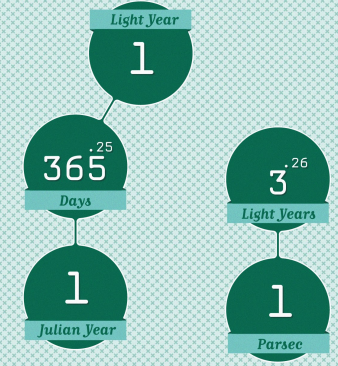
A **Light Year** is the distance that light travels in a vacuum in one Julian Year.

* Planets and Distances not in scale

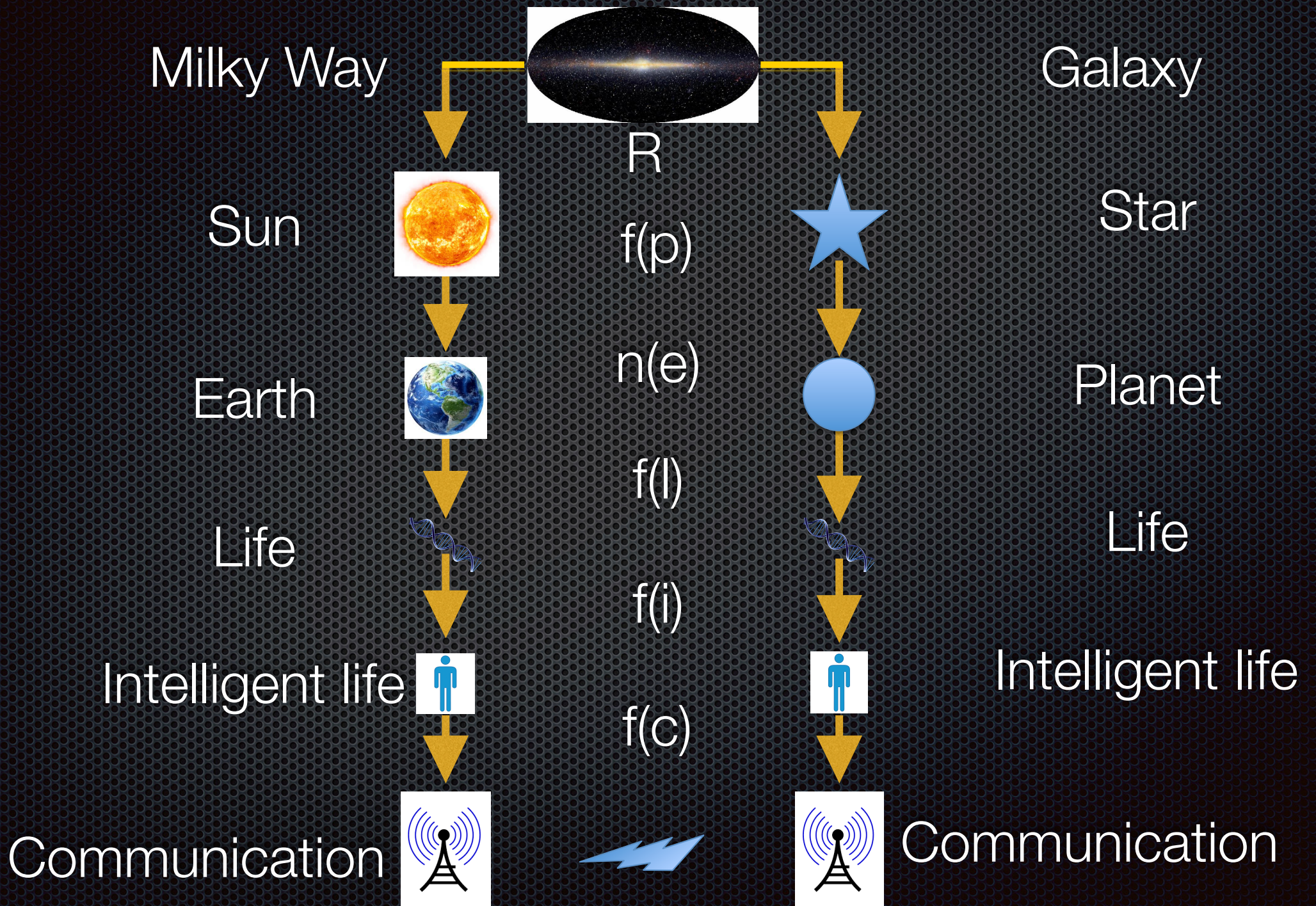


Astronomy

GLOSSARY



Drake Equation



Drake Equation

The Principle of Uniformity

- The principle of Uniformity is the founding element of the Drake equation, it is implicitly assumed that laws of nature and the process or evolution are valid in our entire Galaxy and basically in the Universe.
 - Uniformity of physical laws is widely accepted
 - Does not apply to evolution: but we are looking for planets with conditions comparable to Earth
 - TOE is an extreme case of Uniformity of Nature

The Drake Equation

Teleology

- If like Kant we assume that 'laws of nature' shape reality, instead of provide a description
- If however teleology is used as explanation, this is valid
- Both the 'weak' and 'strong' anthropic principle are examples of teleological reasoning:
"The Universe must have those properties which allow life to develop within it at some stage in its history."
- in biology deterministic teleological reasoning is common: e.g. the metaphor of "The Blind Watchmaker"
- Natural selection is seen as a counter entropic force and a process rather than the outcome of natural selection.
- For 'intelligent life' to emerge, in the absence of theoretical models, the biological processes must converge.

The Drake Equation

The Great Chain of Being

- The continuity is no longer guaranteed: gaps in habitats lead to gaps in the chain
- But still present in e.g. Tegmark's "Mathematical Universe"
 - infinite number of Universes: branching after each quantum event
 - a Mathematical Universe where the mathematical entities are that control the events in all possible universes
 - Here probability dies and determinism lives and the ultimate reality is mathematical. Plato revisited in the 21st century.

Drake Equation

Conclusions

- Anthropocentric bias: searching for intelligent life using radio waves for communication
- Based on a static Universe
- Does not take into account possible high age of other intelligent civilizations.
- Elements of old thinking were demonstrated: Uniformity of Nature, teleological determinism
- This limits the thinking about the possible outcome of random processes
- Are the old principles leading to the idea of Extra Terrestrial Intelligence suitable for the search?

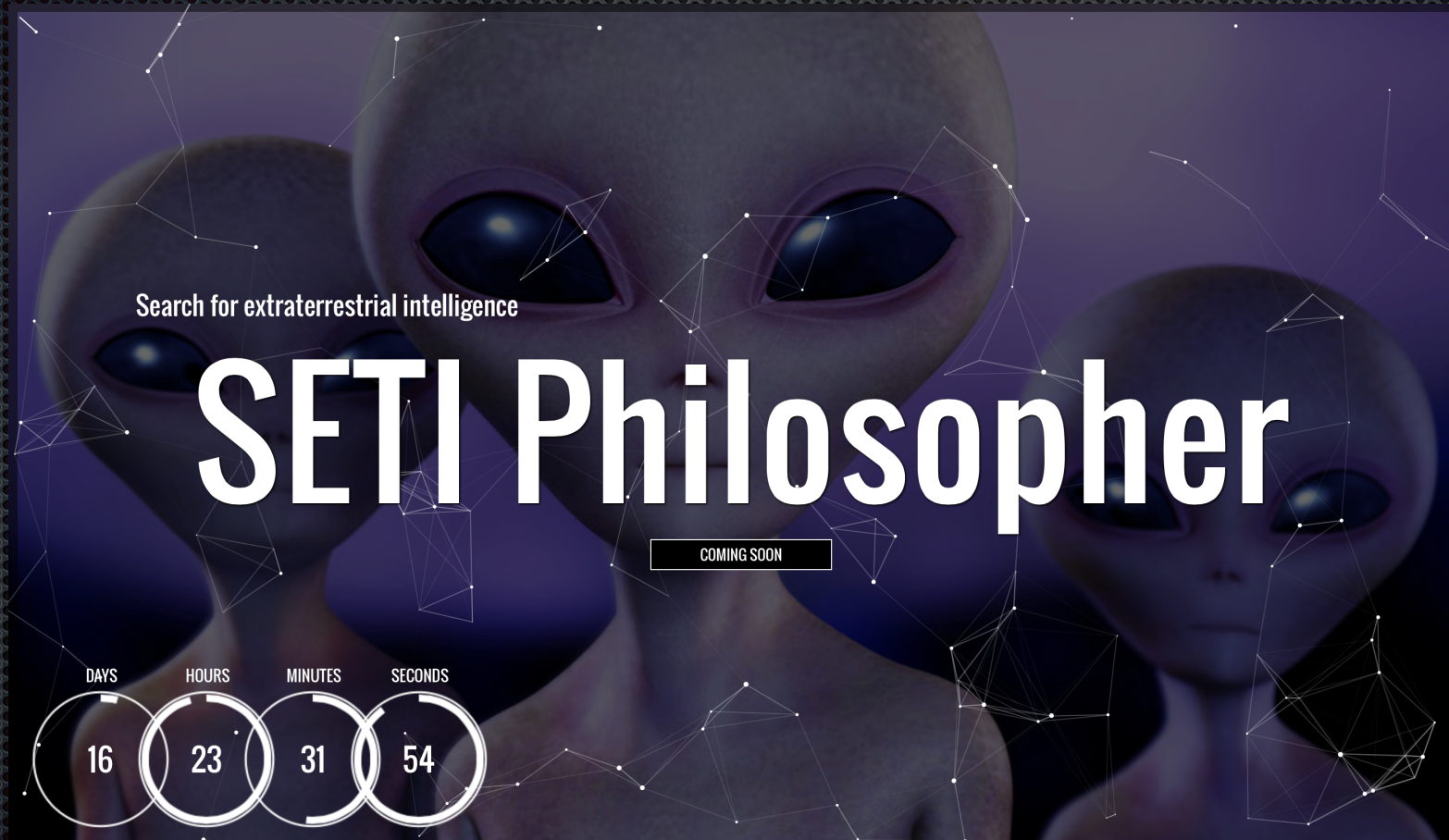
SETI: Abandon old paradigms

- In current Western science is too abstract and left the more concrete, imaginative, and symbolic aspects to the magi and their successors
- Drake Equation looks for civilizations having at least the same level of technological and scientific development: *Why should humans appear at the end of all sequences?* (Gould, 2007:221)
- But scientific theory is a matter of complexification: simple theories are untenable in the real world: Hence we are searching in a too restrictive window
- Intelligence may manifest itself in a larger variety than we expect: chances are we are living in a post biological Universe
- An immense parameter space should be investigated: AI, sociology, (astro) biology, art, bringing more creativity, using synergies between the disciplines:

FROM SEARCH to RESEARCH

Questions??

www.setiphilosopher.com



Search for extraterrestrial intelligence

SETI Philosopher

COMING SOON

DAYS HOURS MINUTES SECONDS

16 23 31 54

The banner features a dark purple background with a grid of white dots and connecting lines, resembling a constellation or network. Three stylized alien heads with large, dark eyes are visible. The text 'Search for extraterrestrial intelligence' is in a small, white, sans-serif font. The title 'SETI Philosopher' is in a large, bold, white, sans-serif font. Below the title is a small black box with the text 'COMING SOON' in white. At the bottom, there is a countdown timer with four circular indicators labeled 'DAYS', 'HOURS', 'MINUTES', and 'SECONDS'. The numbers inside the circles are 16, 23, 31, and 54 respectively.