

Title: Indigenizing the Drake Equation: exploring the question of life in our Galaxy through an Indigenist lens.

Speakers: Hilding Neilson

Series: Cosmology & Gravitation

Date: September 30, 2022 - 1:30 PM

URL: <https://pirsa.org/22090091>

Abstract: The Drake Equation is a thought experiment whose purpose is to understand the ingredients necessary for life and advanced technological civilizations to exist on other worlds in our galaxy. However, beyond reflecting on life on Earth we have no knowledge of many of these ingredients, such as the number of planets that have life, the number of with intelligent life, the number with advanced civilizations, and the lifetimes of these civilizations. In this talk I will review the Drake Equation and the biases that scientists have traditionally had in discussing this equation and how it has led to the current searches of biological and technological signatures. I will discuss how the Drake Equation looks different if we consider it through the lens of Indigenous methods and sciences and how these methods would lead to a dramatically different view of life in our Galaxy.

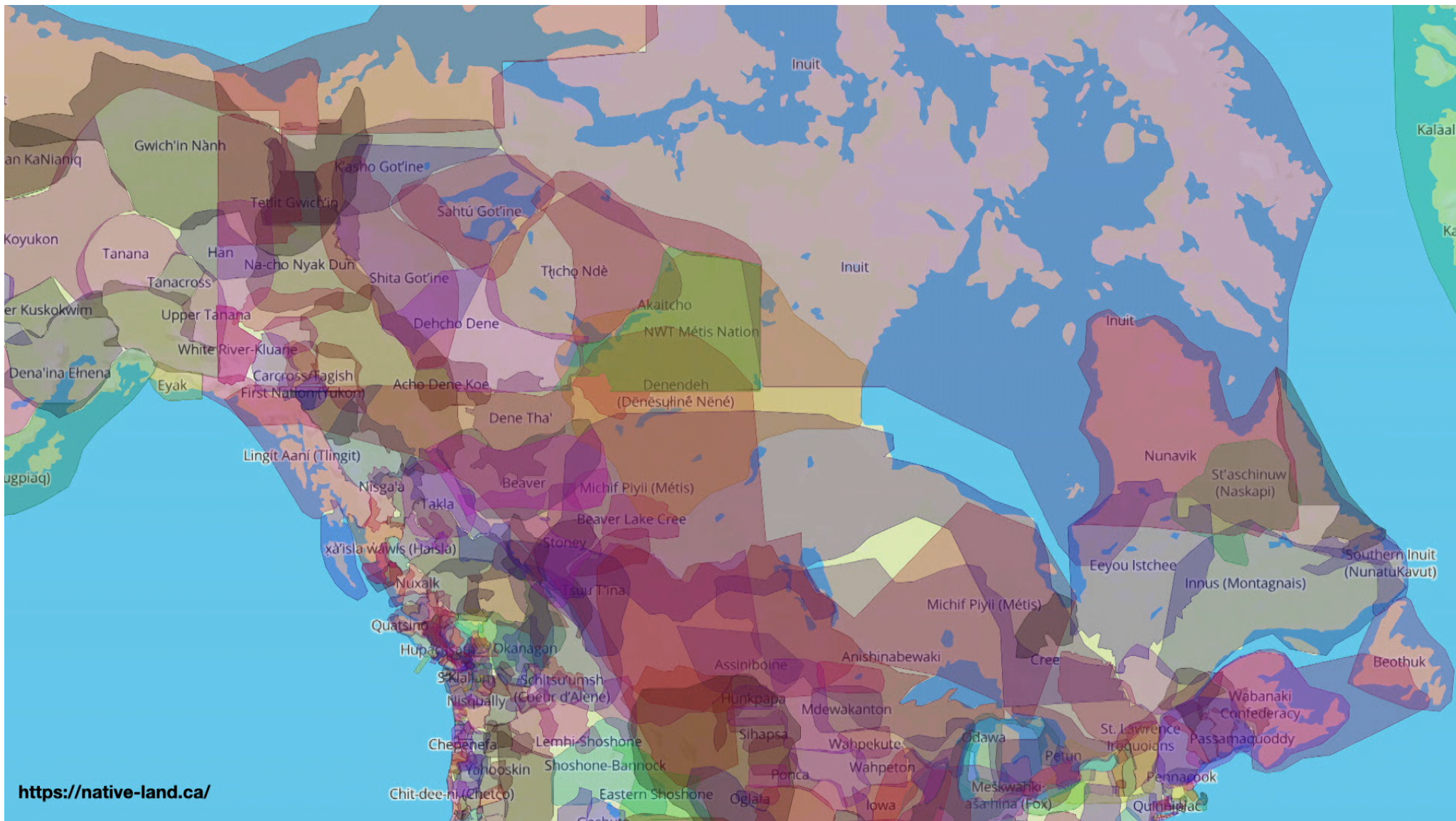
Zoom link: <https://pitp.zoom.us/j/95952883179?pwd=a2lzaEc2UWJER2k2VmhzRVgvMVpoQT09>

Indigenous Knowledges and Western Astronomy: Indigenizing the Drake Equation

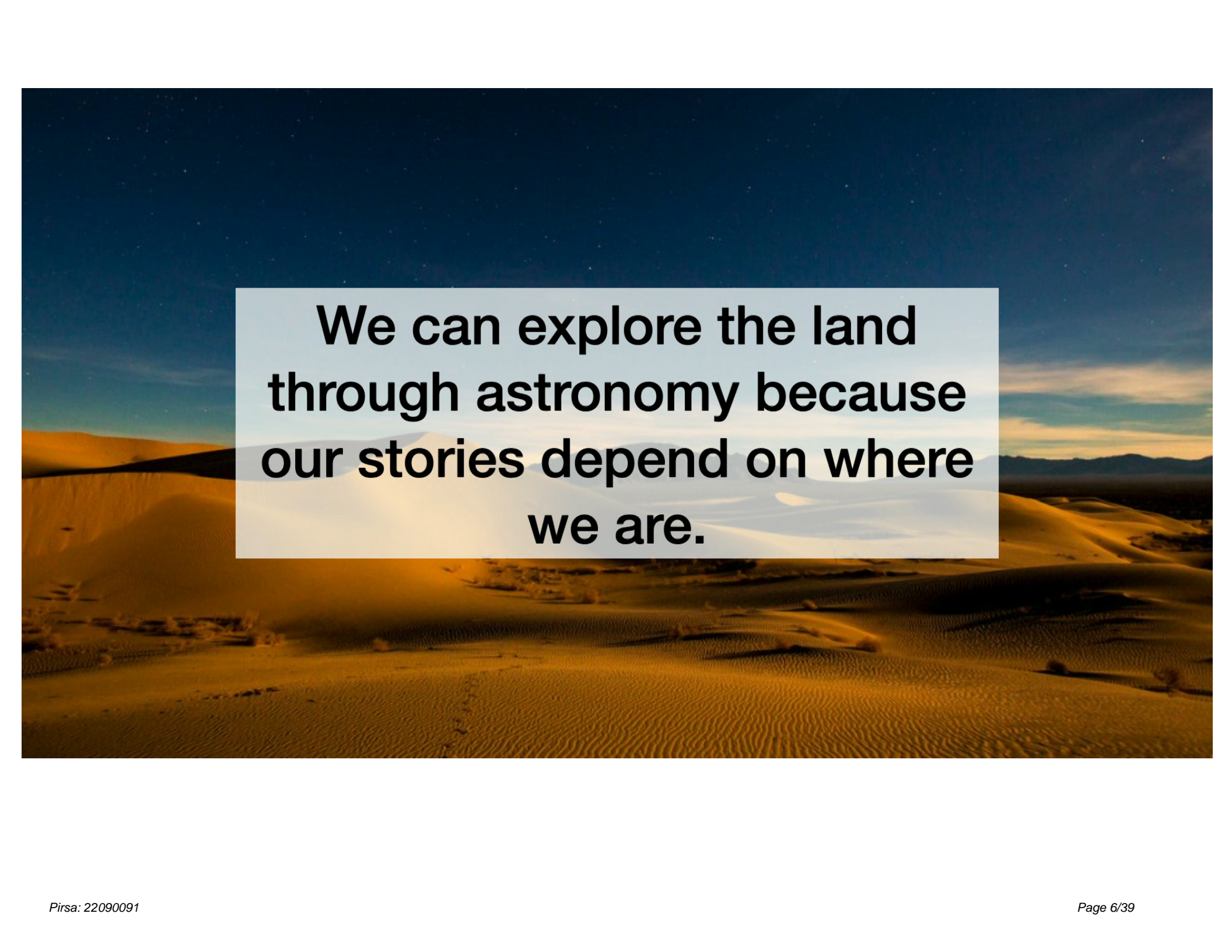
Hilding Neilson, Dept. of Physics & Physical Oceanography, MUN
30 Sept 2022

**Indigenous Peoples have been on
this land since time immemorial.**







A wide-angle photograph of a desert landscape at night. The foreground and middle ground are filled with rolling sand dunes, illuminated by a warm, golden light from the setting or rising sun, creating long shadows and highlighting the ripples in the sand. The sky above is a deep, dark blue, filled with numerous stars and the faint, hazy glow of the Milky Way galaxy. A semi-transparent white rectangular box is centered over the middle of the image, containing the text.

**We can explore the land
through astronomy because
our stories depend on where
we are.**

How might our stories change in Australia? or the Arctic?



For instance... the Moon

Northern Hemisphere



Southern Hemisphere



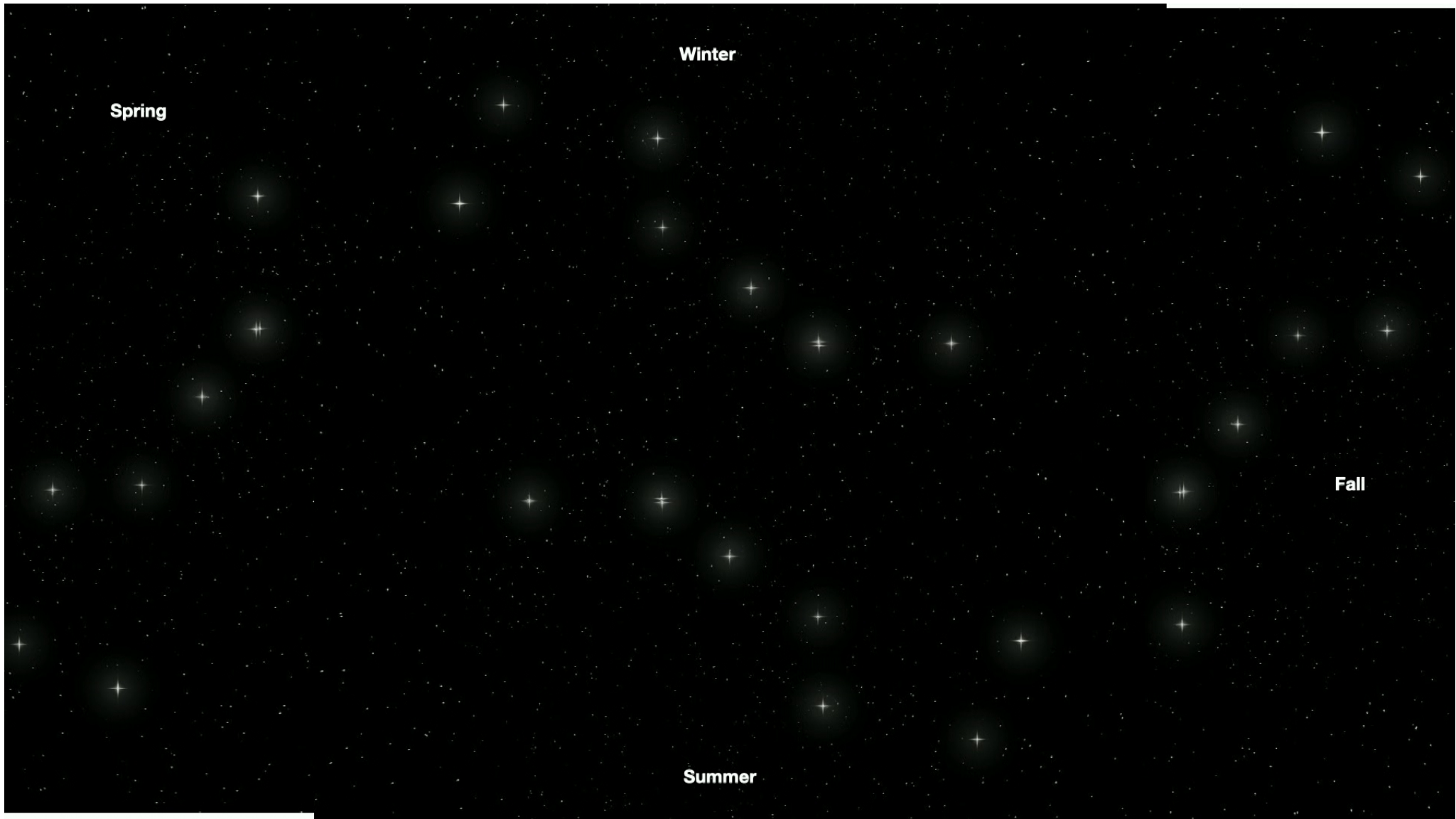
Indigenous knowledges built upon axioms

- What's above reflects below
- Knowledge is relational
- Considers multiple variables that interact concurrently
- Knowledge is (w)holistic
- Nature is holy, sacred, unity, familial
- (There is no pan-Indigenous knowledge system)

Muin and the Seven Bird Hunters



Lillian Marshall, Murdena Marshall & Cheryl Bartlett



**What are some lessons
from this story?**

Indigenous knowledges built upon axioms (Lipe, 2017)

- What's above reflects below
- Knowledge is relational
- Considers multiple variables that interact concurrently
- Knowledge is (w)holistic
- Nature is holy, sacred, unity, familial
- (There is no pan-Indigenous knowledge system)

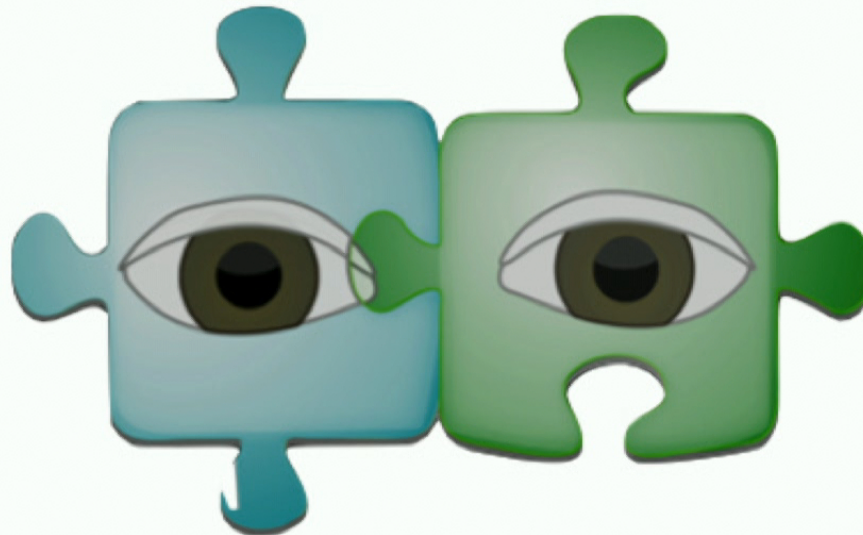
Cajete (2000), Smith (2022, etc.)

Some possible lessons

- Life is cyclical
- When to hunt bears - not in spring or summer
- Sharing and community
- Guide stars
- Circumpolar stars
- Nature of bears, birds...

Embracing Indigenous Knowledge will only make us better scientists

- Many models for blended learning including Two-Eyed Seeing from Mi'kmaw communities (Marshall et al. 2012)

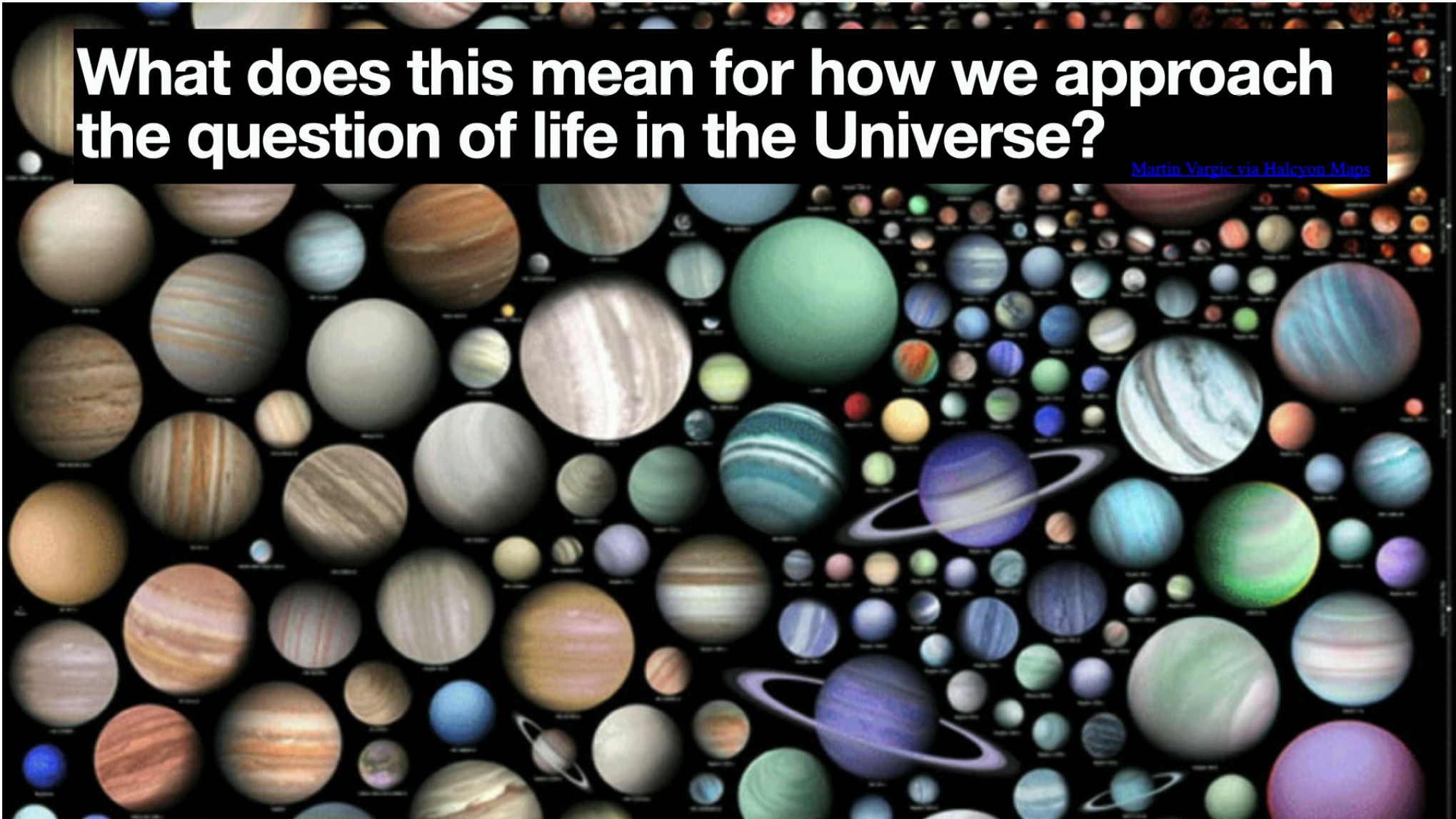


Differences from Traditional Western Science

- What's above reflects below
 - Knowledge is relational
 - Considers multiple variables that interact concurrently
 - Knowledge is (w)holistic
 - Nature is holy, sacred, unity, familial
 - (There is no pan-Indigenous knowledge system)
- Knowledge is objective
 - Attempts to reduce to smallest number of variables
 - Knowledge is in disciplines
 - Nature is hierarchic

What does this mean for how we approach the question of life in the Universe?

[Martin Vargic via Halcyon Maps](#)



There are thousands of known planets in our Galaxy orbiting other stars.



Milky Way Galaxy

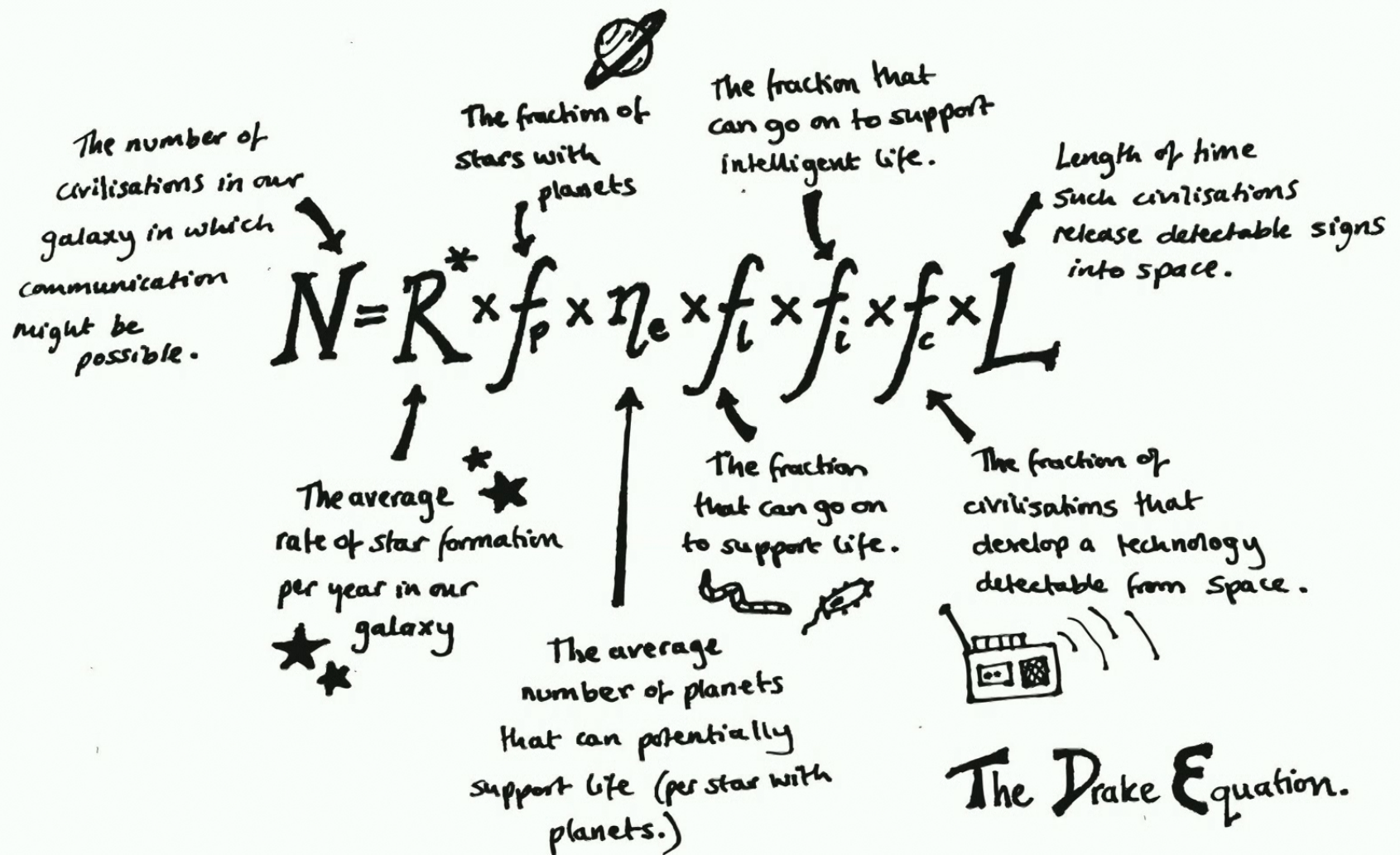
Most Known
Exoplanets

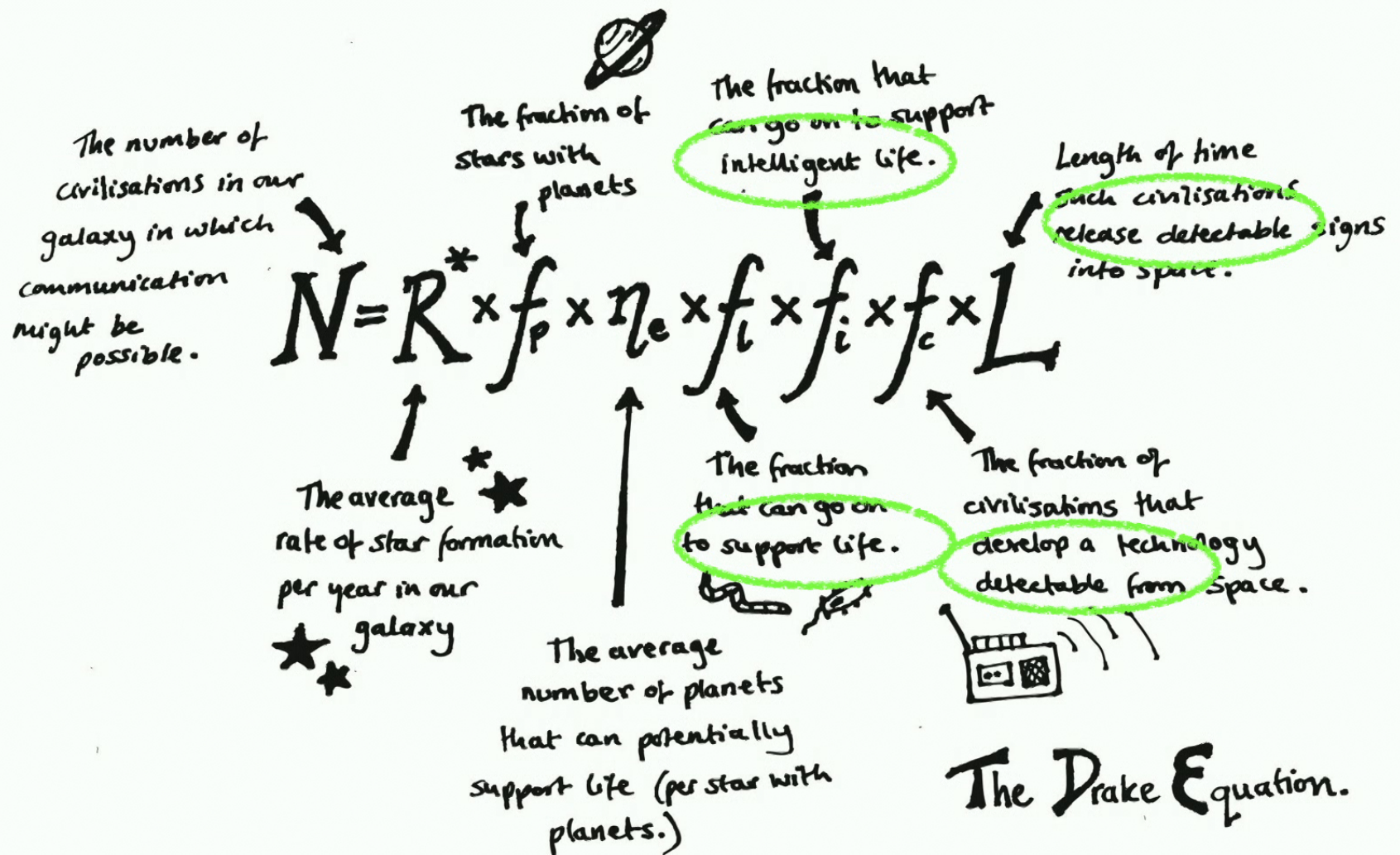
OGLE-2014-BLG-0124L

Microlensing
Exoplanets

Our Solar System

There are more than 4,000 known exoplanets, and humans have observed only a tiny fraction of the Galaxy.





The Drake Equation.

But, we do not have a great understanding of habitability - we are judging habitability relative to the Earth.

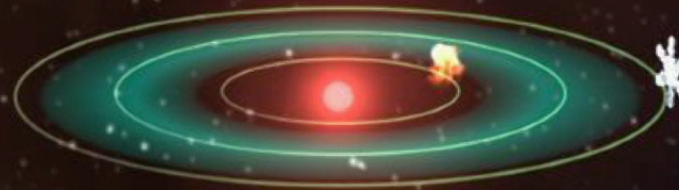
A Star



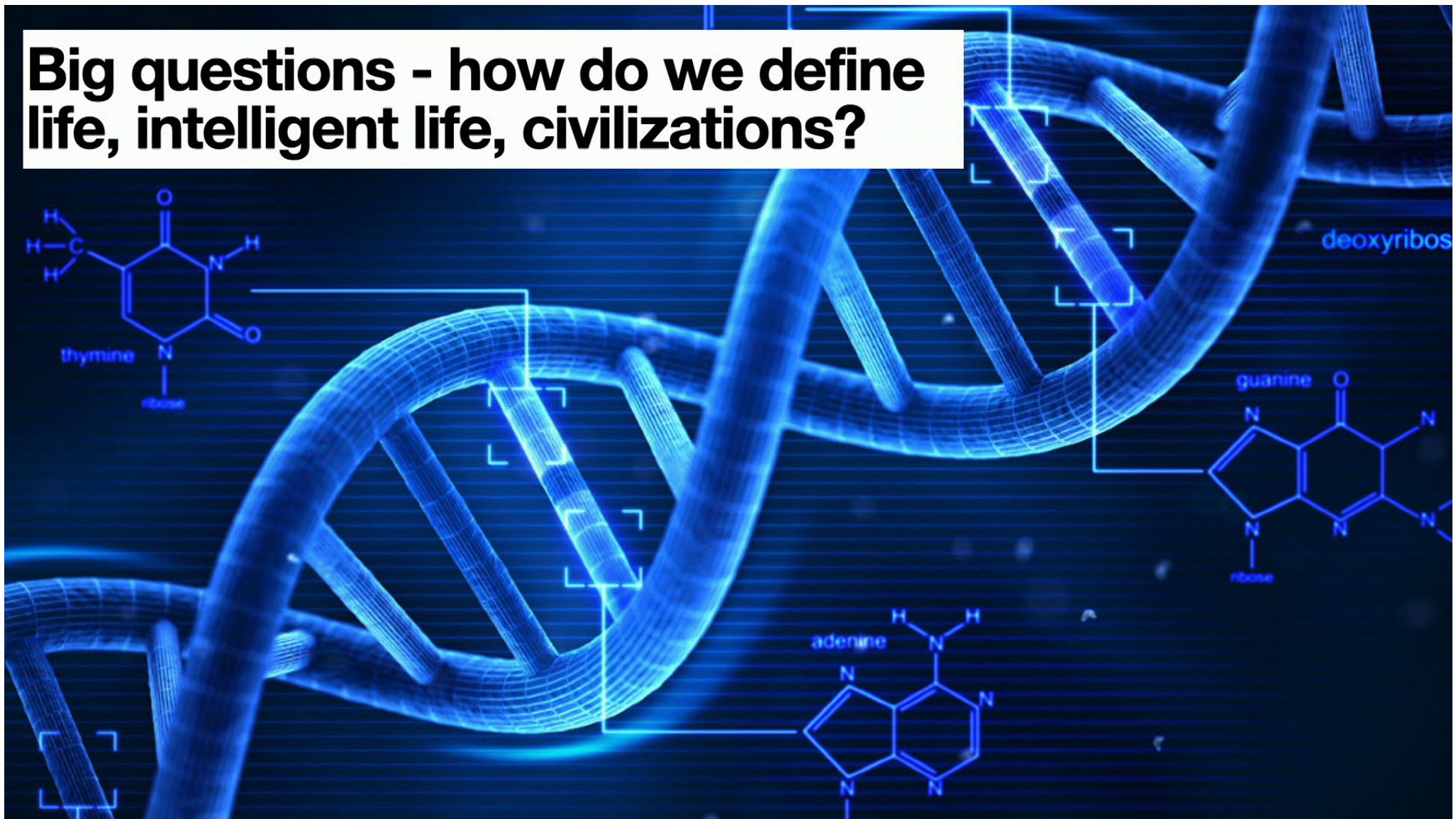
The Sun
G Star



M Star



Big questions - how do we define life, intelligent life, civilizations?

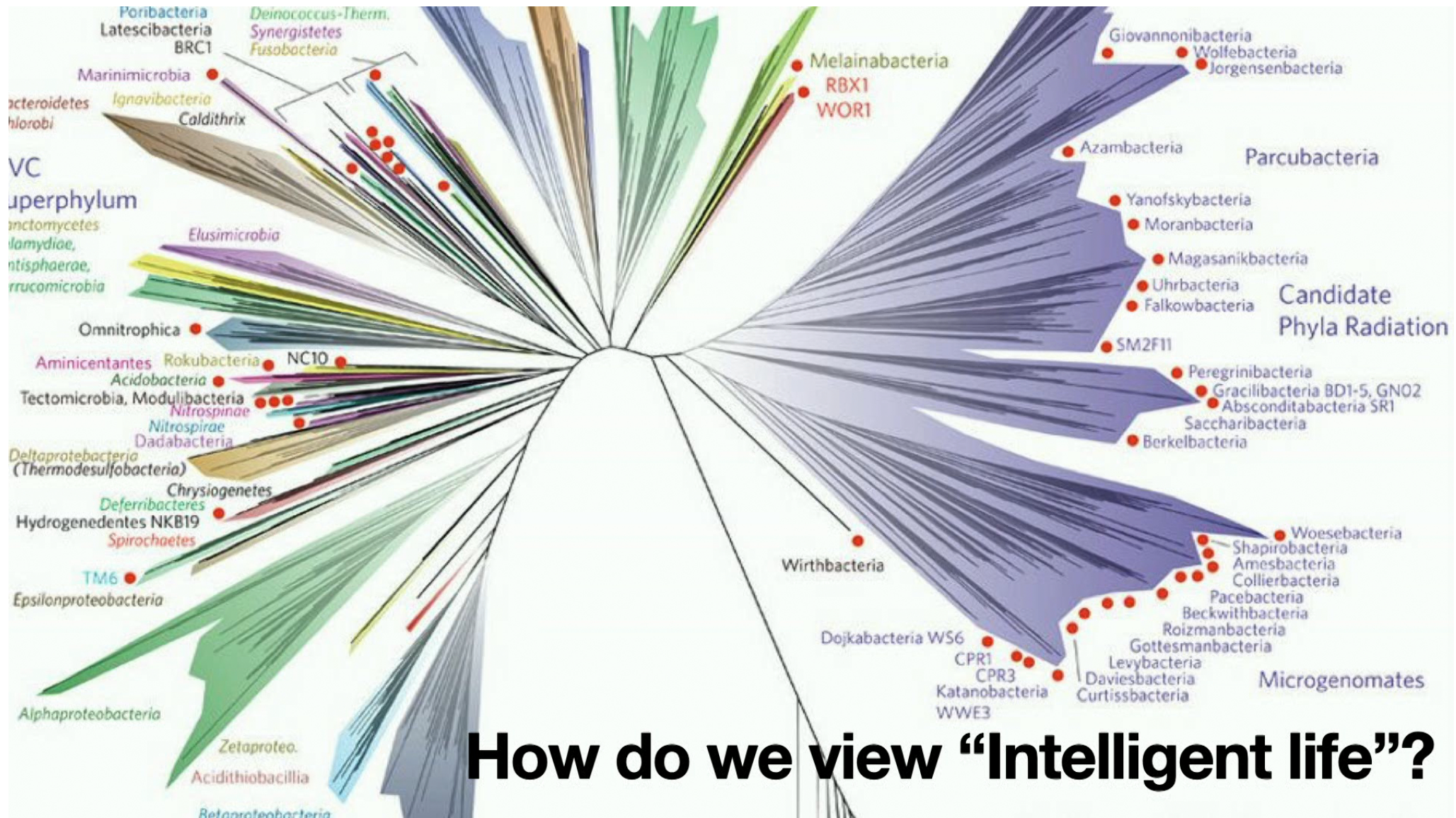


An aerial night view of a dense urban landscape, likely Tokyo, showing a vast number of buildings with illuminated windows and numerous colorful neon signs and billboards. The city lights create a vibrant, textured pattern against the dark sky.

Based on traditional western thought - we are the intelligent life and the civilization

And by “we” I mean western technological societies.

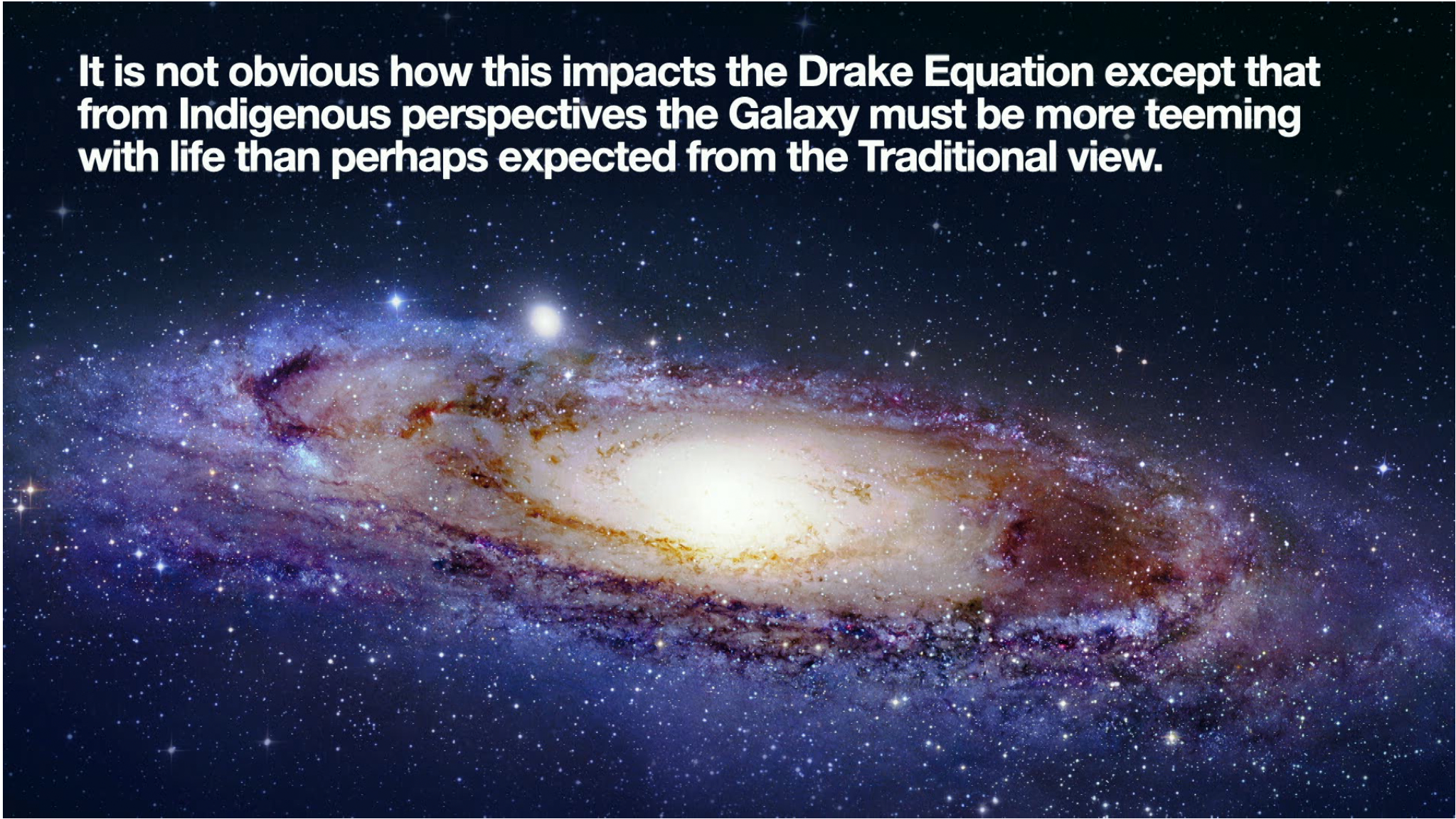
But, these definitions change when we consider them from Indigenous perspectives.



How long do civilizations last / emit detectable signals?

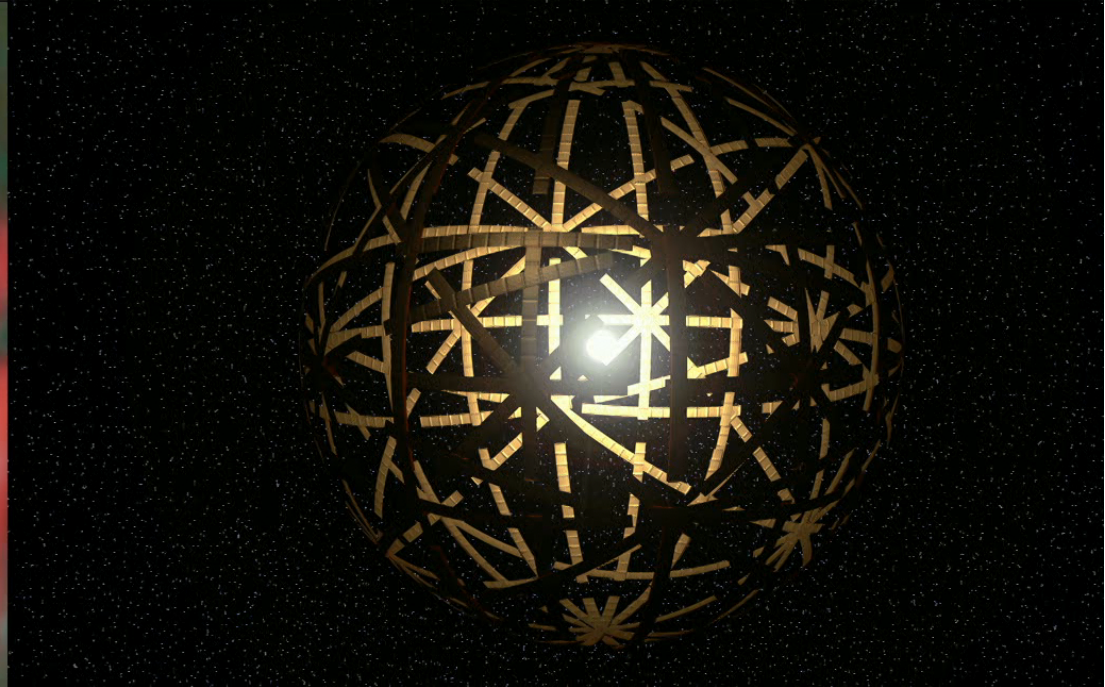


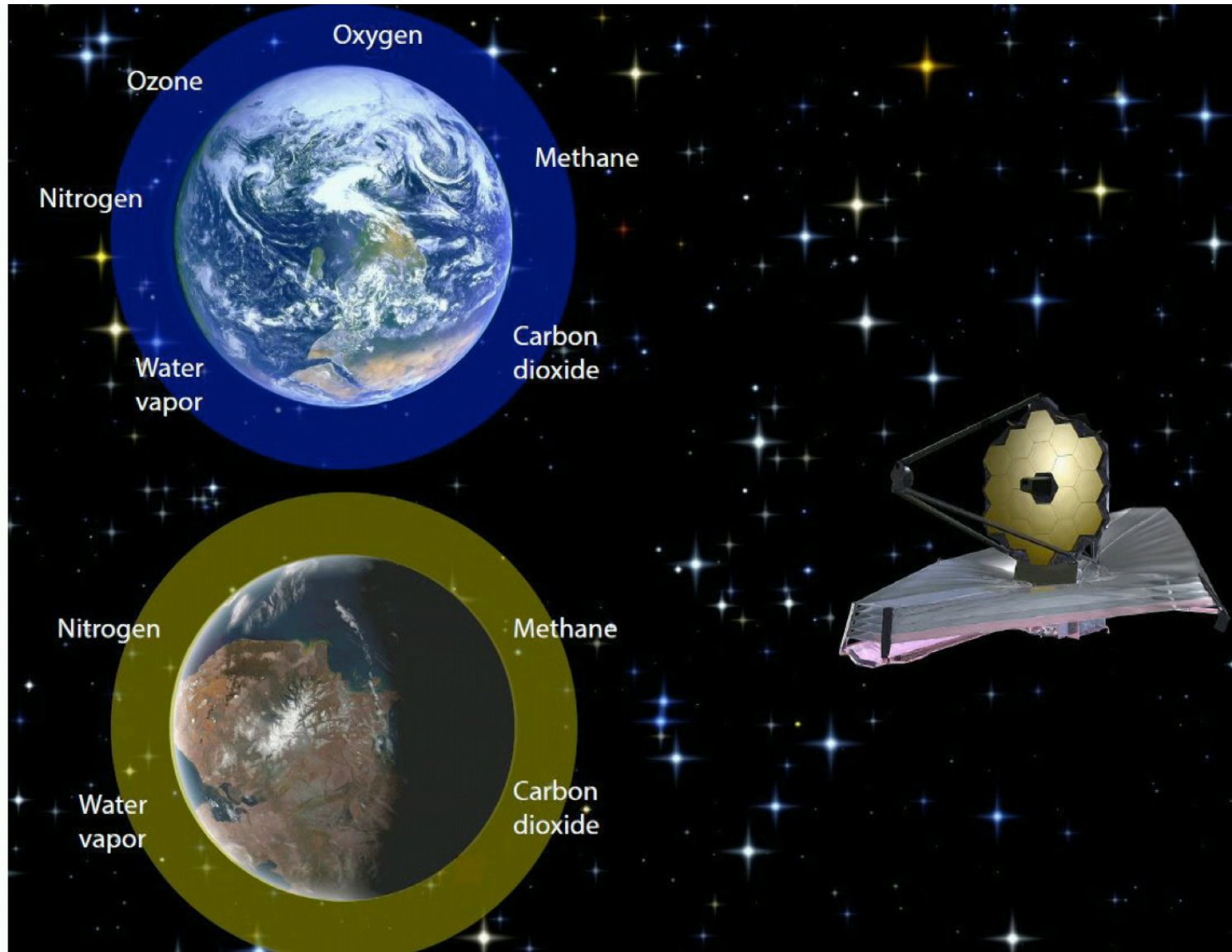
It is not obvious how this impacts the Drake Equation except that from Indigenous perspectives the Galaxy must be more teeming with life than perhaps expected from the Traditional view.



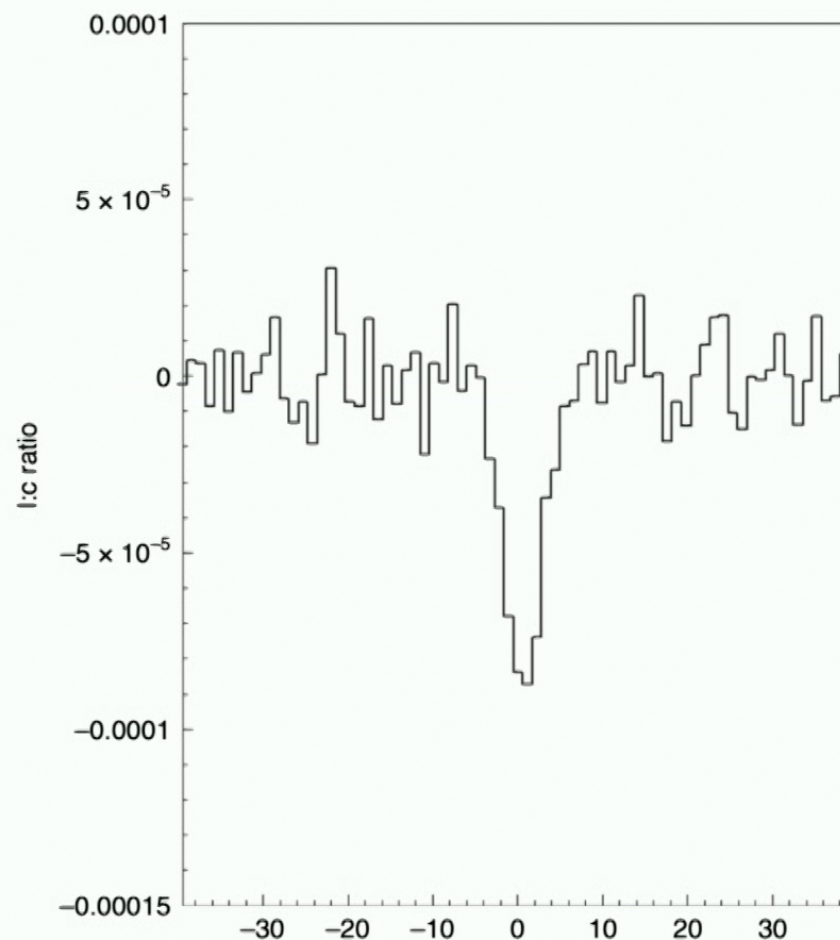
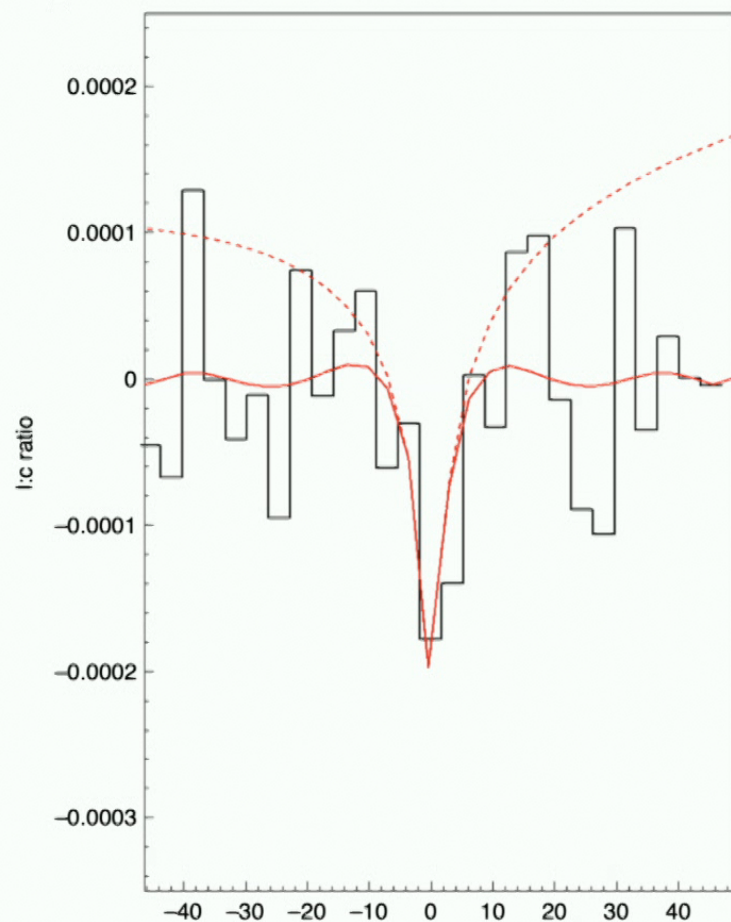
Currently a binary search for life

- Seager (2018), for example, redefined the Drake equation to search for biosignatures
- Wright (2021), and others, discuss SETI in terms of technosignatures.





Phosphine on Venus



Greaves et al. (2020)

Venus frame velocity (km s⁻¹)

Technosignatures typically come in two forms

- Those that reflect our current behaviour on Earth
- Those that reflect ideas of our future impact i.e., science fiction.



Current Technosignatures include



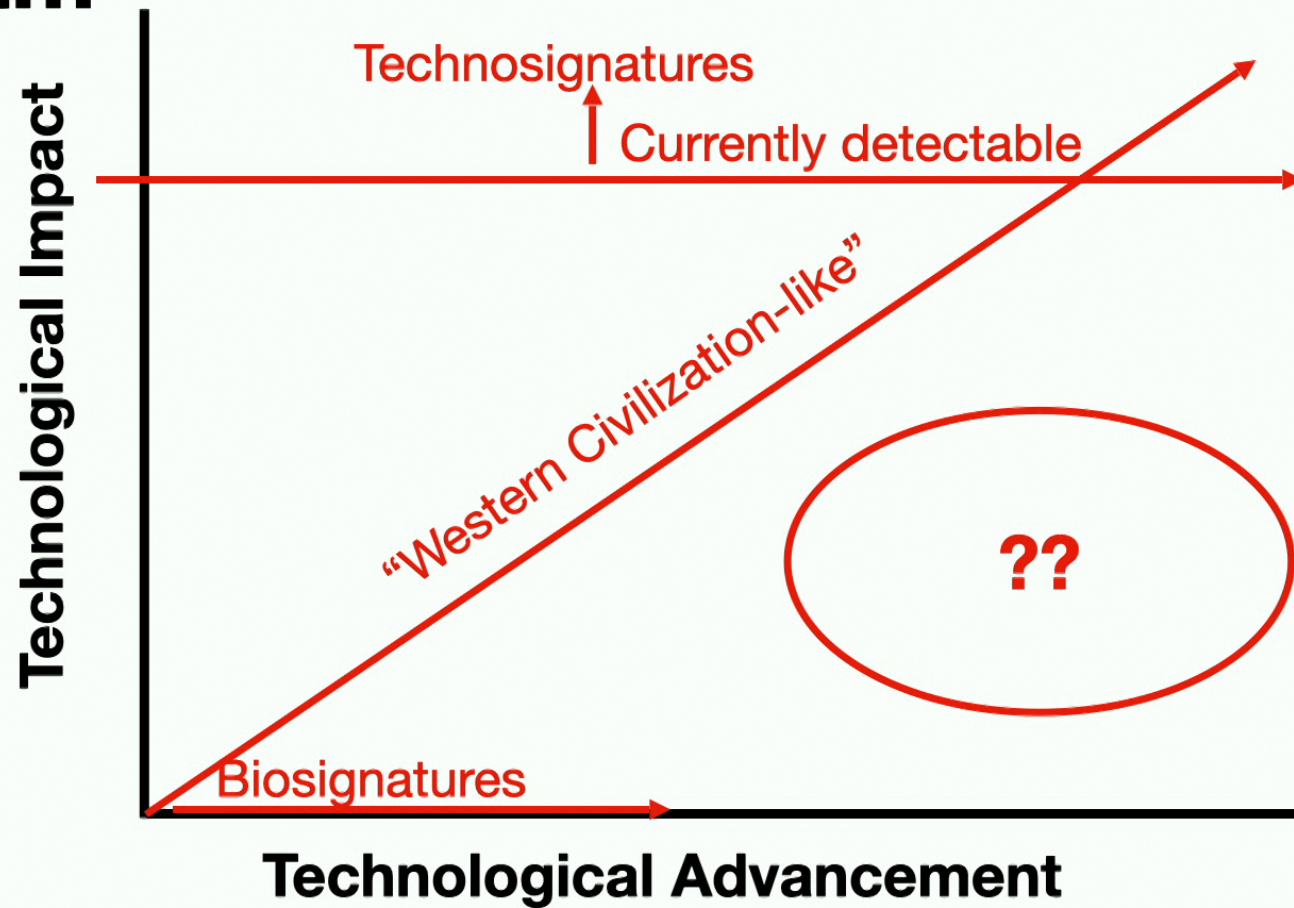
Technosignatures are mostly speculation

- Possibilities include Dyson Spheres, advanced rockets, Light Pollution, Radio signals, climate change, nuclear reactions/explosions...
- In other words - western Civilization...
- But, the key for detection is what is the impact of the technology relative to nature?

Technosignatures are mostly speculation

- Possibilities include Dyson Spheres, advanced rockets, Light Pollution, Radio signals, climate change, nuclear reactions/explosions...
- In other words - western Civilization...
- But, the key for detection is what is the impact of the technology relative to nature?

What is the scale of technology that we can detect...



This leads to another question - the Fermi Paradox.

**IS THERE
ANYBODY
OUT THERE?**

Conclusions

- Indigenous knowledges and perspectives enrich our perspectives of life in the Universe
- How we view the Drake Equation is wedded to Western traditional knowledge
- Impacts how we view advanced civilizations and life in the Universe
- Potentially impacts issues like the Fermi Paradox