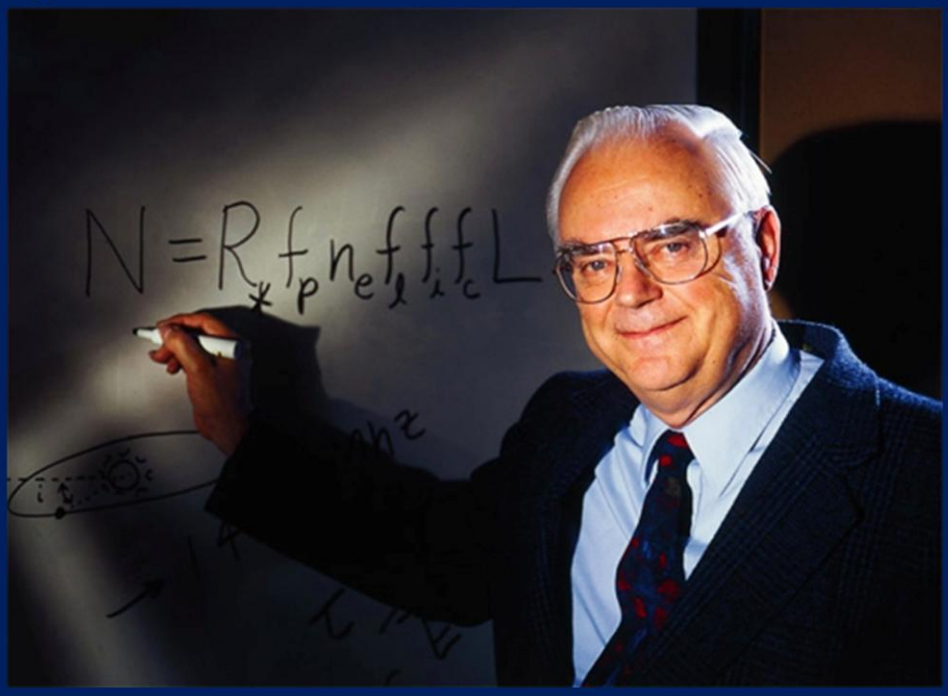
Frank Drake

The ‘goto’ man to ask about other life in space



Frank Drake 28th May 1930 – 2nd September 2022

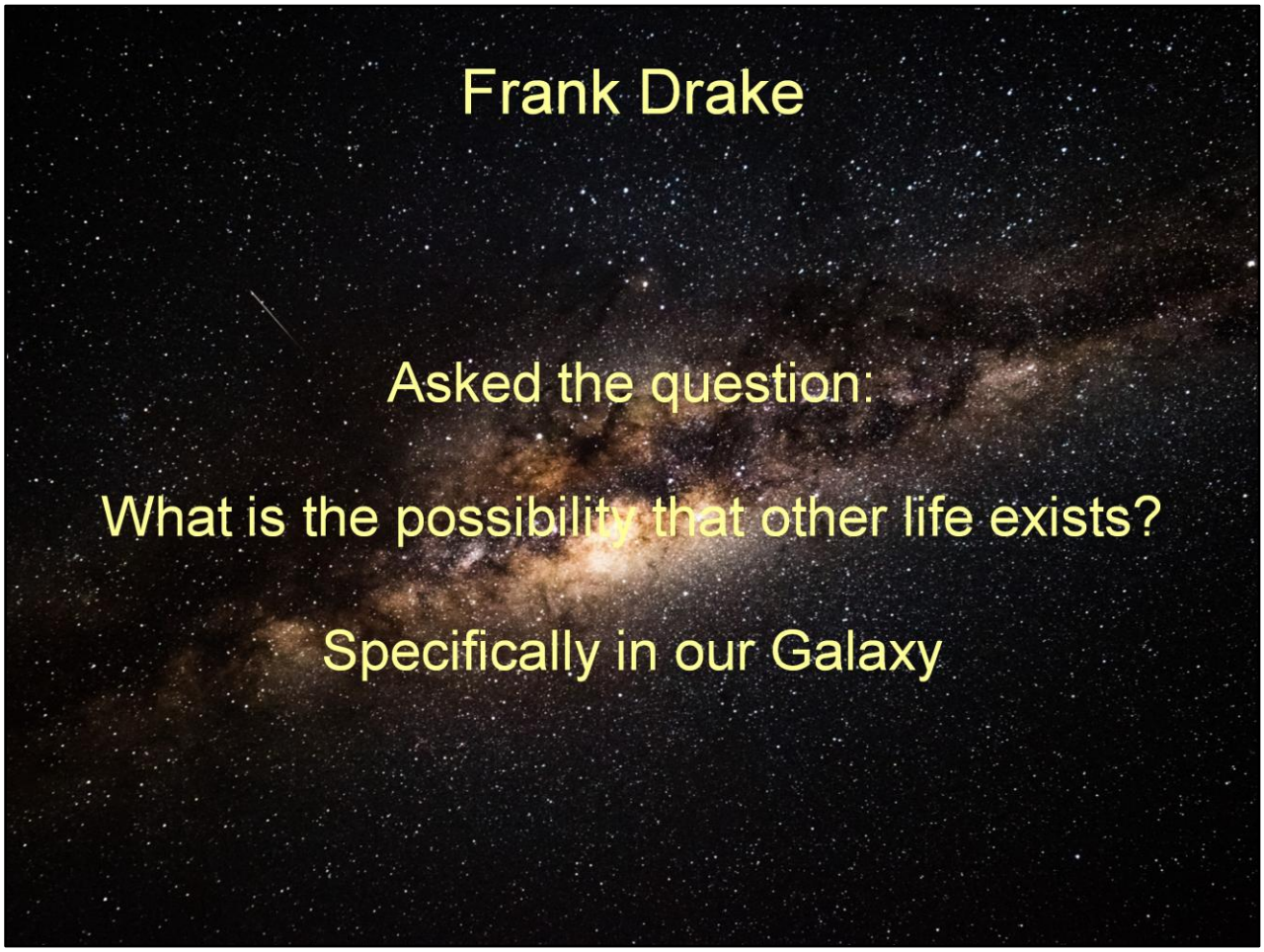
Frank Drake

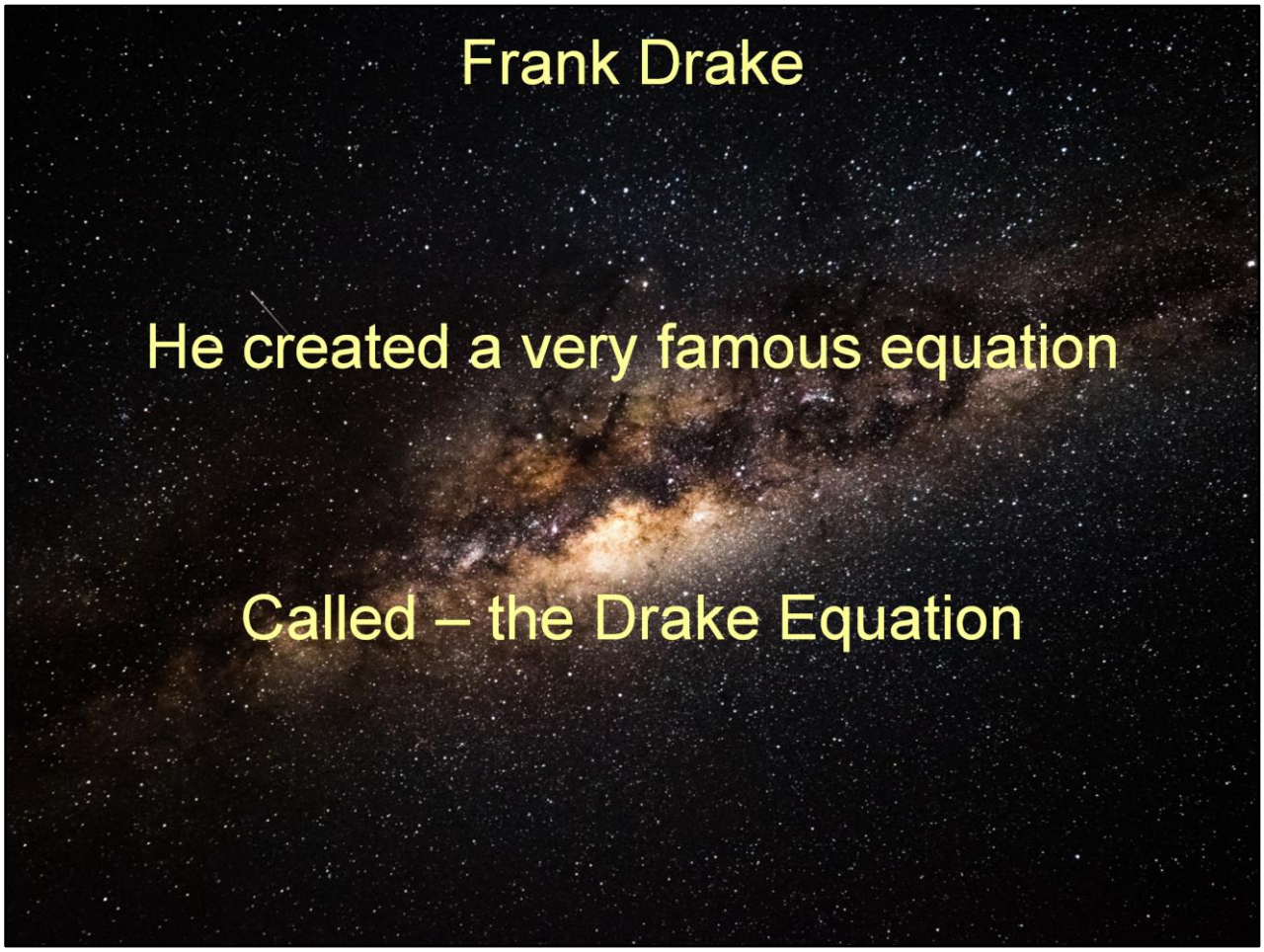
He was a famous American Astrophysicist & Astrobiologist

A great supporter of the Search for Extraterrestrial Intelligence (SETI)

Frank helped draft the Arecibo message with Carl Sagen

But he is most famous for the 'Drake Equation'


Frank Drake
Asked the question:
What is the possibility that other life exists?
Specifically in our Galaxy


Frank Drake
He created a very famous equation
Called – the Drake Equation

The Drake Equation

$$N = (R^*) \times (fp) \times (ne) \times (fl) \times (fi) \times (fc) \times (L)$$

Where '**N**' is 'what is the possibility of other life?'

and

The other terms are elements to give the answer

The Drake Equation

= (R*)

R* = stars capable of supporting life forms in our Galaxy

Some stars are too big (they do not live long enough)
Some stars are too small and unstable
Some stars do not have the right composition for life
Double or multiple stars may not be able to support life

The Drake Equation

$= (R^*) \times (fp)$

fp = fraction of those stars that have a planet or planets

Perhaps some stars may have lost their planets

Some may not have produced planets

The Drake Equation

= (R*) × (fp) × (ne)

ne = average number of planets per system that can support life

Planets may be too hot or too cold (not in Goldilocks Zone)

The parent star may be too unstable

The planets may be too unstable

They may not have suitable chemicals to support life

Our Moon stabilises our planet (perhaps life needs a moon)

The Drake Equation

$$= (R^*) \times (fp) \times (ne) \times (fl)$$

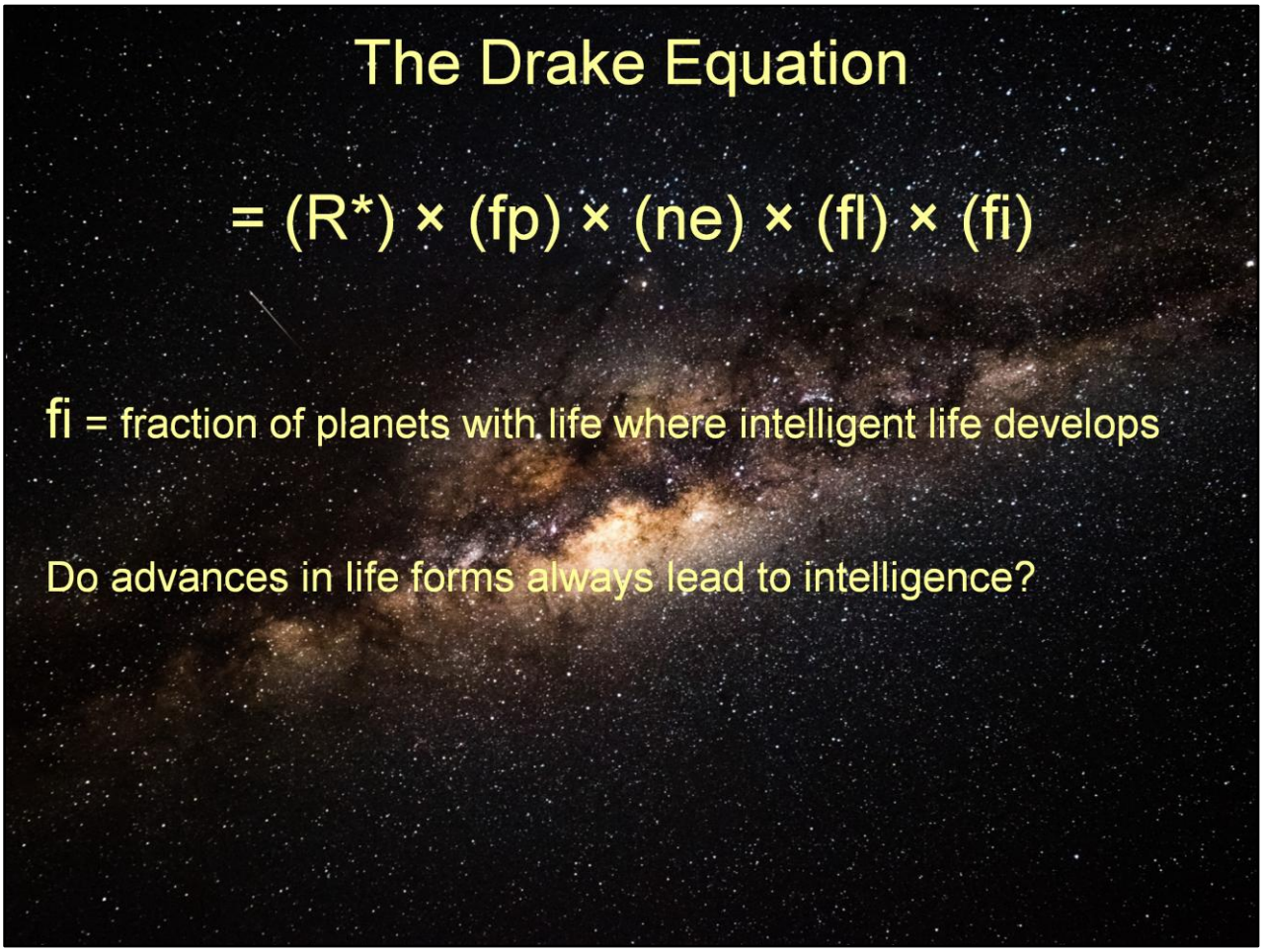
fl = the fraction of those planets on which life actually develops

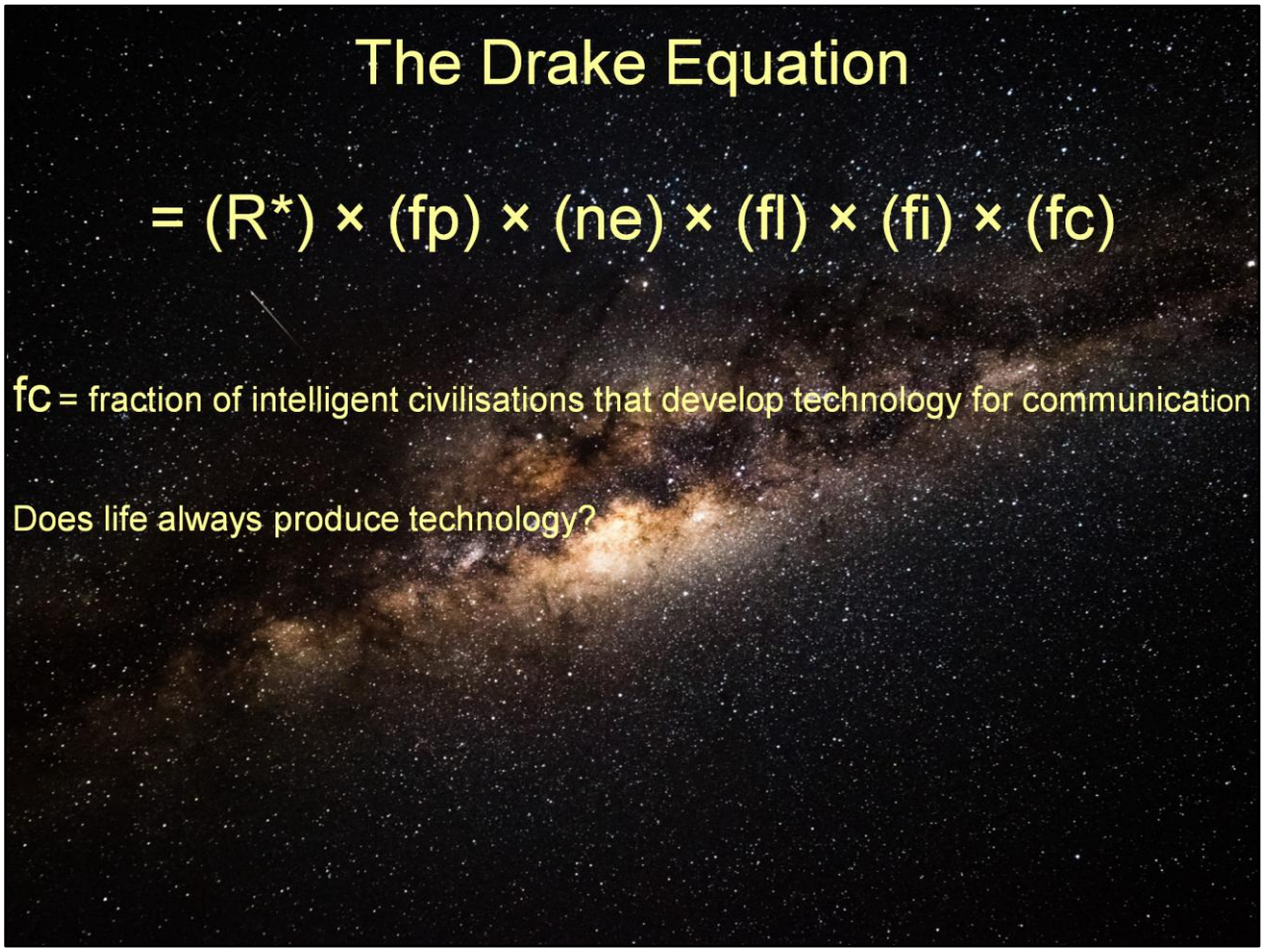
Planets may loose their atmosphere like Mars

Some may be destroyed by collisions with other planets

Some planets will be unstable and change continuously

Our planet is stable but still took 4.3 billion years to produce us


The Drake Equation
= (R*) × (fp) × (ne) × (fl) × (fi)
fi = fraction of planets with life where intelligent life develops
Do advances in life forms always lead to intelligence?


The Drake Equation
= (R*) × (fp) × (ne) × (fl) × (fi) × (fc)
fc = fraction of intelligent civilisations that develop technology for communication
Does life always produce technology?

The Drake Equation

$$= (R^*) \times (fp) \times (ne) \times (fl) \times (fi) \times (fc) \times (L)$$

L = lifetime of those civilisations that develop technology for communication

Can intelligent life survive technology or does it self destruct?

Is there a window of communications technology that can be recognised

Or does technology advance on to other means of communication

Older methods may not be recognised by more advanced civilisations

More advanced communications may be invisible to civilisations like us

There may be a limited time that civilisations transmit and receive

The Drake Equation

$$N = (R^*) \times (fp) \times (ne) \times (fl) \times (fi) \times (fc) \times (L)$$

N = What is the number of civilisations in the Milky Way Galaxy that are capable of producing signals that we can detect on Earth?

The Drake Equation shows us what we must consider
It does not give us the information we need to answer the question

The data for the equation is improving all the time but
there will always be unknown factors that may effect the answer

The Drake Equation

$$N = (R^*) \times (fp) \times (ne) \times (fl) \times (fi) \times (fc) \times (L)$$

N = the number of civilizations in the Milky Way Galaxy that are capable of producing signals that we can detect on Earth?

R* = stars capable of supporting life form in our Galaxy

fp = the fraction of those stars that have a planet or planets

ne = the average number of planets per planetary system that have an environment that can support life

fl = the fraction of those planets that can support life, on which life actually develops

fi = the fraction of those planets with life where intelligent life develops

fc = the fraction of those intelligent civilisations that develop technology for communication

L = the average lifetime of those civilisations that develop technology for communication

The Drake Equation

$$N = (R^*) \times (fp) \times (ne) \times (fl) \times (fi) \times (fc) \times (L)$$

The equation is:

$N = (R^*) \times (fp) \times (ne) \times (fl) \times (fi) \times (fc) \times (L)$

The complete description of the individual terms are:

N = number of civilizations in the Milky Way Galaxy that are capable of producing signals that we can detect on Earth
R* = the rate at which stars capable of supporting life form in our Galaxy
fp = the fraction of those stars that have a planet or planets
ne = the average number of planets per planetary system that have an environment that can support life
fl = the fraction of those planets that can support life on which life actually develops
fi = the fraction of those planets with life where intelligent life develops
fc = the fraction of those intelligent civilizations that develop technology for communication
L = the average lifetime of those civilizations that develop technology for communication


Newbury Astronomical Society Website:
www.naasbeginners.co.uk