Package: extraterrestrial (via r-universe)

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Type Package

Title Astrobiology Equations Estimating Extraterrestrial Life

Version 0.1.0

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Description Finding life outside the planet Earth several is the ultimate goal of an astrobiologist. Using known astronomical measurements and assumptions the probability of extraterrestrial life existence could be estimated. Equations such as the Drake equation (1961) as stated in the paper of Molina (2019) <doi:10.48550/arXiv.1912.01783>, Seager (2013) <https://www.space.com/22648-drake-equation-alien-life-seager.html> and Foucher et al, (2017) <doi:10.3390/life7040040> are included in the 'extraterrestrial' package.

Depends R(>= 3.5.0)

License GPL-3

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RoxygenNote 7.0.2

NeedsCompilation no

Repository https://chesterdeocaris.r-universe.dev

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`drake` *The Drake Equation (1961)*

Description

The classical Drake 1961 equation.

Usage

```
drake(R, fp, Ne, fl, fi, fc, L)
```

Arguments

`R`	the star formation rate.
`fp`	the fraction of stars with planetary systems.
`Ne`	the number of habitable planets in a planetary system.
`fl`	the fraction of the habitable planets that developed life.
`fi`	the fraction of planets with life form that developed intelligence.
`fc`	the fraction of civilizations that perform interstellar communications.
`L`	length of time for civilizations to transmit detectable signals in space.

Value

N the Drake Number. The number of civilizations in the galaxy that communicates.

References

Antonio, J., & Molina, M. (2019). Searching for a standard Drake equation. Journal of the British Interplanetary Society (JBIS) (Vol. 72).

Examples

```
drake(R=2, fp=.45, Ne=0.5, fl=0.2, fi=0.05, fc=0.5, L=500 )
```

fhlwb *Probability of Life in the Universe*

Description

The statistical estimates on the probaility of life in the Universe based on the paper of Frederic Foucher, Keyron Hickman-Lewis, Frances Westall and Andre Brack (2017).

Usage

```
fhlwb(pS, pB, pC, pL, pR, pP, S, V)
```

Arguments

pS	the proportion of stellar systems having a star compatible with the occurrence of the considered stage of life.
pB	the proportion of these star systems with a rocky body located within its habitable zone.
pC	the proportion of rocky bodies compatible with the emergence of life.
pL	the probability that life appeared on these bodies.
pR	the probability that life reached the considered evolutionary stage on these bodies.
pP	the probability of co-existence occurrence of this stage of life on several bodies simultaneously.
S	number of stars in the galaxy in billions
V	volume of the galaxy in trillions light year cube (ly^3)

Value

A list with the following values:

1. PL Estimated proportion of star systems hosting life (
2. NL Estimated number of planets life.
3. DL Average distance between two planets hosting life (in light years).

References

Foucher, F., Hickman-Lewis, K., Westall, F., & Brack, A. (2017). A statistical approach to illustrate the challenge of astrobiology for public outreach. Life, 7(4). <doi:10.3390/life7040040>

Examples

```
fhlwb(pS=1, pB=1, pC=.22, pL=.17, pR=1, pP=0.9, V=47, S=200)
```

seager *The Seager 2013 equation*

Description

An alternative to the Drake 1961 equation. The Seager equation considers the detection biogenic gases in the estimation of planets harboring life.

Usage

```
seager(Ns, fQ, fHZ, fo, fL, fS)
```

Arguments

Ns	number of stars
fQ	fraction of quiet stars
fHZ	fraction with rocky planets within the habitable zone.
fo	fraction of observable planets.
fL	fraction of planets with life.
fS	fraction of planets with detectable gaseous signatures.

Value

N number of planets with signs of life.

References

https://www.cfa.harvard.edu/events/2013/postkepler/Exoplanets_in_the_Post_Kepler_Era/Program_files/Seager.pdf

The Drake Equation Revisited: Interview with Planet Hunter Sara Seager Devin Powell, Astrobiology Magazine 4 September 2013.

Examples

```
seager(Ns=.45, fQ=0.5, fHZ=0.2, fo=0.05, fL=0.5, fS=500)
```

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