

Evidence for God from Probability

The Statistical Probability Argument



The Power of Probability

Once we know something about math, we can see something powerful about the nature of the universe and life on our planet. The problem is, learning enough about math to understand the power of the evidence! So, let's take some time to examine the nature of probability and statistics.



Reviewing Basic Mathematics

Before we can understand the power of the Probability Argument for the Existence of God, we are going to need to review some very simple math so we can grasp the issues at hand (and sound really smart in front of our friends)!



Odds and Probability

Let's start with something very simple: what are the odds of flipping a quarter and having it land "head's up"? Well, the quarter has two sides, so there is a 50/50 chance that a single flip will produce a "head's up" result. Here's another way to state the problem:



*1/2 of the quarter's faces are "heads" and 1/2 of the quarter's faces are "tails"
There is a 50% / 50% chance of flipping either a "heads" or a "tails"*

Now let's make it a bit more interesting. What do you think the odds are of us flipping the quarter TWICE and getting TWO "Head's up" results? This is a little more difficult than getting a single "head's up" result, because in any two flips of the coin, there are four possibilities:

1) Heads / Heads 2) Heads / Tails 3) Tails / Heads 4) Tails / Tails

So, how do we calculate something like this? How do we figure the odds of getting two "heads" in a row? Well, one way to see the problem is to create a math problem based on the percentage of sides that are "heads" on each quarter:



Chance of getting "heads" on first flip x Chance of getting "heads" on second flip

Statistical 0 *0% Chance*

This is an important number to remember, because when the odds of something happening reach this number, you can effectively say that there is a ZERO percent chance of it happening at all. That's important to know as we start to examine the probability of life occurring in our universe...



What Life Requires

OK, now let's take all that math we just learned (or re-learned) and put it to good use. Let's examine the nature of life in the universe. Let's face it; life requires certain universal constants to be in place before it can flourish. There are certain requirements related to the nature of our galaxy and the nature of our planet that must be in place before life can even exist!

Let's look at just one of these requirements. Did you know that the sun is 93 million miles from Earth? Did you know that if our planet was just 15,000 miles closer or farther from the sun, no life could exist on Earth? Now, think about all the different distances that our planet could be from the sun. There are trillions of possibilities in which the planet could be too close, and trillions more that it could be too far! What are the odds that we would be in just the right location? If I were to randomly toss our planet into our solar system, what are the chances that I would place it in the 30,000 mile range that makes life possible to exist? Are the chances one in a million ($1/1,000,000$ or $1/10^6$)? The odds are probably far greater, aren't they? How about one in a trillion ($1/1,000,000,000$ or $1/10^9$)? Let's do something crazy here; let's say that the chances are one in ten. I know that's not possible (it's like saying that we could randomly toss Earth into the Solar System and it would land in the perfect location about one in every ten tosses), but go with me on this for a minute, OK?

The distance from the sun is not the only factor involved in the existence of life here on planet Earth. There are many more universal constants that are required to be perfectly fine-tuned before life can exist. Let's take a look at a PARTIAL list:

Requirements Related to the Universe and Our Galaxy

- Correct local abundance and distribution of dark matter*
- Correct relative abundances of different exotic mass particles*
- Correct decay rates of different exotic mass particles*
- Correct density of quasars*
- Correct density of giant galaxies in the early universe*
- Correct galaxy cluster size*
- Correct galaxy cluster density*
- Correct galaxy cluster location*
- Correct galaxy size*
- Correct galaxy type*
- Correct galaxy mass distribution*
- Correct size of galactic central bulge*
- Correct galaxy location*
- Correct variability of local dwarf galaxy absorption rate*
- Correct quantity of galactic dust*

Correct giant star density in galaxy
Correct frequency of gamma ray bursts in galaxy
Correct star location relative to galactic center
Correct star distance from co-rotation circle of galaxy
Correct ratio of inner dark halo mass to stellar mass for galaxy
Correct star distance from closest spiral arm
Correct z-axis extremes of star's orbit
Correct proximity of solar nebula to a normal type I supernova eruption
Correct timing of solar nebula formation relative to a normal type I supernova eruption
Correct proximity of solar nebula to a type II supernova eruption
Correct timing of solar nebula formation relative to type II supernova eruption
Correct timing of hypernovae eruptions
Correct number of hypernovae eruptions
Correct masses of stars that become hypernovae
Correct flux of cosmic ray protons
Correct variability of cosmic ray proton flux
Correct gas dispersal rate by companion stars, shock waves, and molecular cloud expansion in the Sun's birthing star cluster
Correct number of stars in birthing cluster
Correct density of brown dwarfs
Correct number of giant galaxies in galaxy cluster
Correct number of large galaxies in galaxy cluster
Correct number of dwarf galaxies in galaxy cluster
Correct distance of galaxy's corotation circle from center of galaxy
Correct rate of diffusion of heavy elements from galactic center out to the galaxy's corotation circle
Correct outward migration of star relative to galactic center
Correct degree to which exotic matter self interacts
Correct average quantity of gas infused into the universe's first star clusters
Correct level of supersonic turbulence in the infant universe
Correct number and sizes of intergalactic hydrogen gas clouds in galaxy's vicinity
Correct average longevity of intergalactic hydrogen gas clouds in galaxy's vicinity
Correct avoidance of apsidal phase locking in the orbits of planets in the planetary system
Correct number density of the first metal-free stars to form in the universe
Correct epoch during which the first metal-free stars form in cosmic history
Correct average circumstellar medium density for white dwarf red giant pairs
Correct number densities of metal-poor and extremely metal-poor galaxies
Correct rate of growth of central spheroid for the galaxy
Correct amount of gas infalling into the central core of the galaxy
Correct level of cooling of gas infalling into the central core of the galaxy
Correct heavy element abundance in the intracluster medium for the early universe
Correct rate of infall of intergalactic gas into emerging and growing galaxies during first five billion years of cosmic history
Correct pressure of the intra-galaxy-cluster medium
Correct proximity of solar nebula to a type I supernova whose core underwent significant gravitational collapse before carbon deflagration
Correct timing of solar nebula formation relative to a type I supernova whose core underwent significant gravitational collapse before carbon deflagration

Correct sizes of largest cosmic structures in the universe
Correct level of spiral substructure in spiral galaxy
Correct supernova eruption rate when galaxy is young
Correct range of rotation rates for stars on the verge of becoming supernovae
Correct quantity of dust formed in the ejecta of Population III supernovae
Correct chemical composition of dust ejected by Population III stars
Correct time in cosmic history when the merging of galaxies peaks
Correct density of extragalactic intruder stars in solar neighborhood
Correct density of dust-exporting stars in solar neighborhood
Correct average rate of increase in galaxy sizes
Correct change in average rate of increase in galaxy sizes throughout cosmic history
Correct proximity of solar nebula to asymptotic giant branch stars
Correct timing of solar nebula formation relative to its close approach to asymptotic giant branch stars
Correct quantity and proximity of gamma-ray burst events relative to emerging solar nebula
Correct proximity of superbubbles to planetary system during life epoch of life-support planet
Correct proximity of strong ultraviolet emitting stars to planetary system during life epoch of life-support planet
Correct quantity and proximity of galactic gamma-ray burst events relative to time window for intelligent life
Correct timing of star formation peak for the universe
Correct timing of star formation peak for the galaxy
Correct mass of the galaxy's central black hole
Correct timing of the growth of the galaxy's central black hole
Correct rate of in-spiraling gas into galaxy's central black hole during life epoch
Correct distance from nearest giant galaxy
Correct distance from nearest Seyfert galaxy
Correct amount of mass loss by star in its youth
Correct rate of mass loss of star in its youth
Correct rate of mass loss by star during its middle age
Correct quantity of magnetars (proto-neutron stars with very strong magnetic fields) produced during galaxy's history
Correct variation in coverage of star's surface by faculae
Correct ratio of galaxy's dark halo mass to its baryonic mass
Correct ratio of galaxy's dark halo mass to its dark halo core mass
Correct galaxy cluster formation rate
Correct proximity of supernovae and hypernovae throughout history of planet and planetary system
Correct tidal heating from neighboring galaxies
Correct tidal heating from dark galactic and galaxy cluster halos
Correct intensity and duration of galactic winds
Correct density of dwarf galaxies in vicinity of home galaxy
Correct amount of photoevaporation during planetary formation from parent star and other nearby stars

Requirements Related to the Solar System

Correct number and mass of planets in system suffering significant drift
Correct orbital inclinations of companion planets in system

Correct variation of orbital inclinations of companion planets
Correct inclinations and eccentricities of nearby terrestrial planets
Correct in-spiral rate of stars into black holes within parent galaxy
Correct strength of magnetocentrifugally launched wind of parent star during its protostar era
Correct degree to which the atmospheric composition of the planet departs from thermodynamic equilibrium
Correct delivery rate of volatiles to planet from asteroid-comet belts during epoch of planet formation
Correct amount of outward migration of Neptune
Correct amount of outward migration of Uranus
Correct star formation rate in parent star vicinity during history of that star
Correct variation in star formation rate in parent star vicinity during history of that star
Correct birth date of the star-planetary system
Correct number of stars in system
Correct number and timing of close encounters by nearby stars
Correct proximity of close stellar encounters
Correct masses of close stellar encounters
Correct distance from nearest black hole
Correct absorption rate of planets and planetismals by parent star
Correct star age
Correct star metallicity
Correct ratio of ^{40}K , ^{235}U , ^{238}U , ^{232}Th to iron in star-planetary system
Correct star orbital eccentricity
Correct star mass
Correct star luminosity change relative to speciation types & rates
Correct star color
Correct star rotation rate
Correct rate of change in star rotation rate
Correct star magnetic field
Correct star magnetic field variability
Correct stellar wind strength and variability
Correct short period variation in parent star diameter
Correct star's carbon to oxygen ratio
Correct star's space velocity relative to Local Standard of Rest
Correct star's short term luminosity variability
Correct star's long term luminosity variability
Correct amplitude and duration of star spot cycle
Correct number & timing of solar system encounters with interstellar gas clouds and cloudlets
Correct galactic tidal forces on planetary system
Correct $\text{H}3^+$ production
Correct supernovae rates & locations
Correct white dwarf binary types, rates, & locations
Correct structure of comet cloud surrounding planetary system
Correct polycyclic aromatic hydrocarbon abundance in solar nebula
Correct mass of Neptune
Correct total mass of Kuiper Belt asteroids
Correct mass distribution of Kuiper Belt asteroids

Correct injection efficiency of shock wave material from nearby supernovae into collapsing molecular cloud that forms star and planetary system
Correct number and sizes of planets and planetesimals consumed by star
Correct variations in star's diameter
Correct level of spot production on star's surface
Correct variability of spot production on star's surface
Correct mass of outer gas giant planet relative to inner gas giant planet
Correct Kozai oscillation level in planetary system
Correct reduction of Kuiper Belt mass during planetary system's early history
Correct efficiency of stellar mass loss during final stages of stellar burning
Correct number, mass, and distance from star of gas giant planets in addition to planets of the mass and distance of Jupiter and Saturn

Requirements Related to Planet Earth

Correct planetary distance from star
Correct inclination of planetary orbit
Correct axis tilt of planet
Correct rate of change of axial tilt
Correct period and size of axis tilt variation
Correct planetary rotation period
Correct rate of change in planetary rotation period
Correct planetary revolution period
Correct planetary orbit eccentricity
Correct rate of change of planetary orbital eccentricity
Correct rate of change of planetary inclination
Correct period and size of eccentricity variation
Correct period and size of inclination variation
Correct precession in planet's rotation
Correct rate of change in planet's precession
Correct number of moons
Correct mass and distance of moon
Correct surface gravity (escape velocity)
Correct tidal force from sun and moon
Correct magnetic field
Correct rate of change & character of change in magnetic field
Correct albedo (planet reflectivity)
Correct density density of interstellar and interplanetary dust particles in vicinity of life-support planet
Correct reducing strength of planet's primordial mantle
Correct thickness of crust
Correct timing of birth of continent formation
Correct oceans-to-continent ratio
Correct rate of change in oceans to continent ratio
Correct global distribution of continents
Correct frequency, timing, & extent of ice ages
Correct frequency, timing, & extent of global snowball events
Correct silicate dust annealing by nebular shocks
Correct asteroidal & cometary collision rate
Correct change in asteroidal & cometary collision rates

Correct rate of change in asteroidal & cometary collision rates
Correct mass of body colliding with primordial Earth
Correct timing of body colliding with primordial Earth
Correct location of body's collision with primordial Earth
Correct position & mass of Jupiter relative to Earth
Correct major planet eccentricities
Correct major planet orbital instabilities
Correct drift and rate of drift in major planet distances
Correct number & distribution of planets
Correct distance of gas giant planets from mean motion resonances
Correct orbital separation distances among inner planets
Correct oxygen quantity in the atmosphere
Correct nitrogen quantity in the atmosphere
Correct carbon monoxide quantity in the atmosphere
Correct chlorine quantity in the atmosphere
Correct aerosol particle density emitted from the forests
Correct cobalt quantity in the earth's crust
Correct arsenic quantity in the earth's crust
Correct copper quantity in the earth's crust
Correct boron quantity in the earth's crust
Correct cadmium quantity in the earth's crust
Correct calcium quantity in the earth's crust
Correct fluorine quantity in the earth's crust
Correct iodine quantity in the earth's crust
Correct magnesium quantity in the earth's crust
Correct nickel quantity in crust
Correct phosphorus quantity in crust
Correct potassium quantity in crust
Correct tin quantity in crust
Correct zinc quantity in crust
Correct molybdenum quantity in crust
Correct vanadium quantity in crust
Correct chromium quantity in crust
Correct selenium quantity in crust
Correct iron quantity in oceans
Correct tropospheric ozone quantity
Correct stratospheric ozone quantity
Correct mesospheric ozone quantity
Correct water vapor level in atmosphere
Correct oxygen to nitrogen ratio in atmosphere
Correct quantity of greenhouse gases in atmosphere
Correct quantity of greenhouse gases in atmosphere
Correct rate of change in greenhouse gases in atmosphere
Correct poleward heat transport in atmosphere by mid-latitude storms
Correct quantity of forest & grass fires
Correct quantity of sea salt aerosols in troposphere
Correct soil mineralization
Correct quantity of anaerobic bacteria in the oceans
Correct quantity of aerobic bacteria in the oceans

Correct quantity of anaerobic nitrogen-fixing bacteria in the early oceans
Correct quantity, variety, and timing of sulfate-reducing bacteria
Correct quantity of geobacteraceae
Correct quantity of aerobic photoheterotrophic bacteria
Correct quantity of decomposer bacteria in soil
Correct quantity of mycorrhizal fungi in soil
Correct quantity of nitrifying microbes in soil
Correct quantity & timing of vascular plant introductions
Correct quantity, timing, & placement of carbonate-producing animals
Correct quantity, timing, & placement of methanogens
Correct phosphorus and iron absorption by banded iron formations
Correct quantity of soil sulfur
Correct ratio of electrically conducting inner core radius to radius of the adjacent turbulent fluid shell
Correct ratio of core to shell (see above) magnetic diffusivity
Correct magnetic Reynold's number of the shell (see above)
Correct elasticity of iron in the inner core
Correct electromagnetic Maxwell shear stresses in the inner core
Correct core precession frequency for planet
Correct rate of interior heat loss for planet
Correct quantity of sulfur in the planet's core
Correct quantity of silicon in the planet's core
Correct quantity of water at subduction zones in the crust
Correct quantity of high pressure ice in subducting crustal slabs
Correct hydration rate of subducted minerals
Correct water absorption capacity of planet's lower mantle
Correct tectonic activity
Correct rate of decline in tectonic activity
Correct volcanic activity
Correct rate of decline in volcanic activity
Correct location of volcanic eruptions
Correct continental relief
Correct viscosity at Earth core boundaries
Correct viscosity of lithosphere
Correct thickness of mid-mantle boundary
Correct rate of sedimentary loading at crustal subduction zones
Correct biomass to comet infall ratio
Correct regularity of cometary infall
Correct number, intensity, and location of hurricanes
Correct intensity of primordial cosmic superwinds
Correct number of smoking quasars
Correct formation of large terrestrial planet in the presence of two or more gas giant planets
Correct orbital stability of large terrestrial planet in the presence of two or more gas giant planets
Correct total mass of Oort Cloud objects
Correct mass distribution of Oort Cloud objects
Correct air turbulence in troposphere
Correct quantity of sulfate aerosols in troposphere

Correct quantity of actinide bioreducing bacteria
Correct quantity of phytoplankton
Correct hydrothermal alteration of ancient oceanic basalts
Correct quantity of iodocarbon-emitting marine organisms
Correct location of dislocation creep relative to diffusion creep in and near the crust-mantle boundary (determines mantle convection dynamics)
Correct size of oxygen sinks in the planet's crust
Correct size of oxygen sinks in the planet's mantle
Correct mantle plume production
Correct average rainfall precipitation
Correct variation and timing of average rainfall precipitation
Correct atmospheric transparency
Correct atmospheric pressure
Correct atmospheric viscosity
Correct atmospheric electric discharge rate
Correct atmospheric temperature gradient
Correct carbon dioxide level in atmosphere
Correct rates of change in carbon dioxide levels in atmosphere throughout the planet's history
Correct rates of change in water vapor levels in atmosphere throughout the planet's history
Correct rate of change in methane level in early atmosphere
Correct Q-value (rigidity) of planet during its early history
Correct variation in Q-value of planet during its early history
Correct migration of planet during its formation in the protoplanetary disk
Correct viscosity gradient in protoplanetary disk
Correct frequency of late impacts by large asteroids and comets
Correct size of the carbon sink in the deep mantle of the planet
Correct ratio of dual water molecules, (H₂O)₂, to single water molecules, H₂O, in the troposphere
Correct quantity of volatiles on and in Earth-sized planet in the habitable zone
Correct triggering of El Nino events by explosive volcanic eruptions
Correct time window between the peak of kerogen production and the appearance of intelligent life
Correct time window between the production of cisterns in the planet's crust that can effectively collect and store petroleum and natural gas and the appearance of intelligent life
Correct efficiency of flows of silicate melt, hypersaline hydrothermal fluids, and hydrothermal vapors in the upper crust
Correct efficiency of ocean pumps that return nutrients to ocean surfaces
Correct sulfur and sulfate content of oceans
Correct orientation of continents relative to prevailing winds
Correct infall of buckminsterfullerenes from interplanetary and interstellar space upon surface of planet
Correct quantity of silicic acid in the oceans
Correct heat flow through the planet's mantle from radiometric decay in planet's core
Correct water absorption by planet's mantle

OK, each requirement on this partial list of universal constants (322 constants listed here) is



If we really take the time to think about it, we can quickly see how unreasonable it would be to assume something is true in spite of the tremendously prohibitive odds against it being true. Let's say that I was to tell you that I was going to repeatedly flip a coin and hope to come up with a sequence of all heads. Let's imagine that I begin by flipping the coin for the first time, and after it lands in my palm, I quickly cover it with the other hand. Then imagine that I take a guarded peek at the coin and announce, "heads" without showing it to you. Then I quickly repeat the process, again guarding the result and announcing, "heads" for a second time (and again without showing the quarter to you). Let's say I continue to do this for ten more flips, each time covering the coin quickly and claiming that I have "heads", but never showing you the result. At some point are you going to stop me and demand to see the coin? At some point are you going to begin to doubt that I have that many consecutive "heads" and demand for me to show you the coin each time I flip it? Why would you begin to get suspicious? Why would you doubt me?

Well, you would be wise to doubt me because you already understand enough about "odds" to know that the chance of my flipping that many "heads" in a row is statistically improbable! Remember our calculations related to the quarter flipping? Well, here is how we would calculate the odds of flipping ten "heads" in a row:

$$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2^{10}} = \frac{1}{1024}$$

There's a one in 1,024 chance of getting ten heads in a row. That's why you were getting so suspicious about my being able to achieve such a feat. You knew the long odds. You knew that it was simply not reasonable to assume that I could beat these odds when the probability was $1/2^{10}$! OK, so if you are suspicious about my telling the truth in this simple example where the probability is $1/2^{10}$ against my telling the truth, how much more suspicious should you be when someone tells you that the universe and our planet came to support life as the result of purely natural processes when the odds against this truth are $1/10^{322}$? Why is it that you would be quick to doubt me when I claim to flip a quarter the same way ten times in a row, but slow to doubt those who would try to convince you that life exists here on earth as the result of something OTHER than Divine Intervention?

The reality is that the most reasonable inference from the evidence of statistical probabilities is that we live on a planet that shouldn't be here except for the fact that something or someone OUTSIDE the natural realm made it possible for us to be here. The evidence points to a creator God who is able to transcend the 'long odds'.