

# irefuteitthus....

cogitative writing, imaginative photography

home essays quotes about contact

---

## A Fallacy of Gamblers: The Collective Noun for Creationists

Gary Hill



*"How would a single cell organism have a spirit or name animals or realize it was naked?"*  
(anonymous creationist debater)

### The Lure of the Wager

Imagine you're at the horse racing track and fancy having a bet. There's no shortage of advice from the pundits and two horses are passionately commended to you by their respective owners. One of these horses has won every race it has entered in its 400 year or so lifetime (in our imaginary world horses live nearly forever). It's the evens favourite. The other horse is thousands of years older but has never won a race in about 400 years. It's listed at 1000/1 against. Hold that thought.

## The Lure of the Debate

Recently I was involved in a lengthy debate with some fundamentalist Christians on the possible mechanisms underlying the origin of life, i.e., the evidence for and against abiogenesis vs. supernatural creation. Abiogenesis (also known as biopoiesis) is well defined. It is the hypothesis that very slowly, over an incredibly long amount of time, specific chemical components existing in specific chemical environments joined together and assembled in such a way they became able to replicate themselves. As these replications added additional chemical assemblies to their structure they became more complex and the result of that process is what we now know as biology. This hypothesis acknowledges that the boundary between chemistry and biology remains unclear, and so the boundary between non-life and life remains inherently fuzzy. Like other physical systems it's probably an inevitable emergent phenomenon given the availability of certain physical conditions. It's also reasonable to hypothesise that, in common with every other emergent mechanism of which we are aware this mechanism too is hypothesised to need no influence (consciousness, mind or inspiration etc) originating outside the physical system.

Creationism (both young and old-earth varieties) asserts the opposite; that life cannot emerge from non-life in the absence of supernatural intervention. However creationists are burdened by a difficulty in defining what a supernatural event or process entails. Two conflicting claims are generally made regarding the supernatural. On one view, the supernatural is defined as a reality antithesis to the physical realm, wholly unconstrained by the physical laws that apply to the known universe. In this case any event or process that violates physical laws and so incompatible with accepted scientific findings can be defined as supernatural. If so, observations of the supernatural would appear to be an extremely rare, very subtle or much more likely to my mind, non-existent event. On another view, there is the assertion that the supernatural realm demonstrates regular and plentiful physical effects on the observable universe and there is an allied claim, by some, that the interaction is reciprocal. Note that this second view directly contradicts the first.

If the first view is accepted, a clear difference should be discernible between a naturalistic and a supernatural event and process, i.e., should a supernatural event occur clear evidence would exist that a physical explanation is completely impossible or at best, highly improbable. If the second view is accepted, however, the existence (or not) of supernatural effects becomes unfalsifiable. A true physical explanation for an unexplained phenomenon might yet be forthcoming or, even when physical causation is plainly evident, God can always be claimed to move in mysterious ways, including via purely physical means. Circling the wagons around the supernatural and devising *ad hoc* hypotheses for evidence that *per se* refutes supernatural claims is a self-refuting strategy, however, because the same game can be played by both sides. For why not accept similarly *ad hoc* hypotheses to explain an absence of evidence for physical causation?

We can look at this argument another way. What if there were no naturalistic hypotheses generated for the origin of life and every explanation we were ever able to devise required input from a supernatural source? Creationists would surely consider this to be sound evidence that a supernatural input was necessary for life to emerge. So why not turn that argument around and accept that because we actually are able to generate a growing number of plausible hypotheses regarding abiogenesis, then the requirement for supernatural input is moot? If both the absence and the presence of plausible hypotheses for abiogenesis lead you think that a supernatural input is necessary for the origin of life then you're not thinking critically. Accepting the second view, then, effectively kills any incontrovertible claim of supernatural creation.

My experience is that some Christian fundamentalists do appreciate this dilemma and many young and old earth creationists favour the first view when arguing about the emergence of life. Paradoxically, though, young earth creationists, especially, tend to favour the second view when debating other supernatural claims, such as the efficacy of intercessory prayer. Regardless of creationist type, however, I observe two tacit assumptions underlying their reasoning. First, supernatural creation is their null hypothesis or default position. They reason that as we have, as yet, no conclusive evidence for abiogenesis it logically follows (for them) that supernatural causation must be true. Creationists appear not to be aware (or simply don't care) that asserting a claim as true on the basis that no evidence has been provided to the contrary is a prime example of an *argumentum ad ignorantiam* or 'argument from ignorance'. It is also hubristic. Of course, hubris does come cheap compared to applying critical thinking, an honest search for knowledge and the humility to admit the limitations of one's claims. Second, creationists attempt to disparage scientific methodologies by claiming that relying on science as the arbiter on this matter is little more than an example of faith. To their mind, science merely presupposes that life has a physical causation and so people like me place their 'faith' in science because we don't want a supernatural creation scenario to be true. These two assumptions serve as the basis for their tactical approach when debating, which is usually centred on arguing from a template of inflexible notions such as:

1. Everything is created; therefore everything that exists is *prima facie* evidence for a creation.
2. Once a phenomenon has been deemed to be created no further naturalistic explanation, no matter how strong the data, will be considered.
3. Any phenomenon deemed to be complex is *prima facie* evidence of creation.
4. Any phenomenon deemed to be improbable is *prima facie* evidence of creation.
5. All gaps in knowledge are *prima facie* evidence of creation.
6. If two explanations are proffered for a phenomenon, one supernatural and the other naturalistic, the former always takes precedence, no matter the quantity and/or quality of the data for the latter.
7. In cases where the data appear to overwhelmingly support a naturalistic causation this is always due to the naturalistic bias of the researchers.
8. Anything not currently explained by science will never be explained by science.
9. No argument in favour of creation should ever be discarded, no matter how much it has been discredited.
10. When a creationist argument is widely discredited this is a cue to repeat it *ad nauseum*.

It seems, then, that there are two distinct horses in this race. The first horse is called 'Abiogenesis'. It's owned by a consortium known as 'Science' and is ridden by a single jockey, whose name is 'Methodological Naturalism' (often indistinguishable by creationists to 'Philosophical Naturalism'). She always rides well regardless of the race conditions. Indeed, 'Methodological Naturalism' is easily the best jockey in the history of the sport. The second horse is named 'Supernatural Creationism' and is owned by a consortium called 'Religion'. It carries one of three available jockeys who are chosen depending on the race conditions on the day. Jockey number one is called 'Faith'. 'Faith' believes that even though 'Supernatural Creationism' hasn't won a race in 400 years it will eventually prove to be the superior horse. This is arguably a reverse version of the 'Gambler's Fallacy', the view that because some event has occurred less frequently in the past it is deemed likely to occur more frequently in the future, thereby balancing some natural state of the universe. Jockey number two goes by the name of 'Dogma'. He has blindly run the exact same tactical race regardless of the conditions, and continues to blithely disregard any advice or evidence. Jockey number three, a relative newcomer to the scene, calls himself 'Presuppositionalism'. He appears to have the uncanny ability to produce, in highly susceptible gamblers, the illusion that he is actually winning his race even though his horse constantly meanders off to the side of the track and, on occasions, has even been observed to run in the opposite direction to his competitor. Proponents of supernatural creationism tend to change jockey mid-race with annoying regularity.

A race is run every time 'Methodological Naturalism' climbs aboard a horse and goes for a gallop i.e., on every occasion an experimental procedure is performed or a systematic observation is made. It is a far from trivial observation that 'Methodological Naturalism' has always crossed the finish line first, regardless of which horse she's riding. This consistent result is not because supernatural causation is inscrutable to science; supernatural claims invariably come bundled with some (often highly specified) degree of probability concerning some physical state of the universe making these claims testable simply by inspecting whether or not the universe actually displays that state. If so, further investigation can be made by careful consideration of plausible alternatives testable via the hypothetico-deductive method. This has been done in a variety of areas where the supernatural has been claimed to have effect including, but not limited to, beneficial effects of intercessory prayer on patient outcomes (Aviles et al., 2001; Benson et al., 2006), paranormal phenomena (see Alcock, 2003), astrology (Carlson, 1985; McGrew & McFall, 1990; Kelly, 1998) and even Bible code prophecies (McKay et al., 1999). Thus, contrary to the notions of my debating opponents, I do not arbitrarily hold faith in scientific methodologies and so presuppose naturalism. Rather, I observe the expanding pattern of natural explanations replacing supernatural explanations and, as a result, have reasoned confidence in the ability of methodological naturalism to investigate other supernatural claims including the emergence of life. I wager accordingly.

The 'Emergence of Life Research Gold Cup' is currently being run and the race has yet to be completed. This is a vital race for 'Supernatural Creationism' because, having watched their horses win no race in the past 400 years, the 'Religion' consortium appears to genuinely consider that this is the one race their horse will definitely win. In this way they exhibit the classic symptoms of an addiction to gambling; the belief that the more they lose, the closer they get to winning the big one. Indeed, they are so confident they frequently claim a winner before the race is completed, thus considering themselves at liberty to cherry pick any data malleable enough to support their assertion. The lure of finally crossing the finish line has led to the publicising of some dubious reasoning that has unfortunately become commonplace in the minds of those who, though opinionated, are nevertheless not inclined to pursue these kinds of subjects with any serious scientific or philosophical depth. In addition to their well-known

habit of appealing to authority by extensive quote mining, creationists frequently frame the premises to their arguments to construct 'heads I win, tails you lose' scenarios. Examples: If science is unable to create life, it must be because they don't have the necessary supernatural ingredient. If science does create life it will only be because doing so requires an intelligent being. At the beginning this must have been God. If life is only found in a single location in the universe we are the lucky ones chosen by God. If the universe is found to be fecund with life this is evidence that God wants the universe to be that way. If the universe is fine-tuned for life this is evidence for God. If the universe is not fine-tuned for life the fact that we are able to survive on this remote outpost of an uninviting universe is evidence that God is acting benevolently toward us.....

### **The Lure of the Lack of Definition**

While there is as yet no scientific consensus on what variables might consistently distinguish life from non-life there are nevertheless agreed operational definitions for the purposes of scientific research and discussion. In contrast, creationists have yet to agree on the actual race distance and actual location of the finishing post. You will search in vain for any agreed creationist definition of 'life', though they invariably refer to 'life' as if everyone knows what the word means (not dissimilarly to their concept of 'kinds'; we're still waiting for the definition of a 'kind', yet every creationist apparently knows what the term means). This distinction is crucial; merely making sweeping claims that 'life' cannot naturally emerge from 'non-life' is insufficient for any serious student of this subject. At the very least, creationists need to identify some definitive chemical and biological criteria by which they can consistently differentiate life from non-life. If they're not able to do that how can they even begin to make claims that life cannot emerge from non-life? So, whenever 'Abiogenesis' noses ahead in the race and monomers to polymers, self-replicating RNA or even self-assembling lipid membrane structures are created in the laboratory, creationists remain able to put their version of the finishing line further and further forward. They can demand new expectations for the win such as recognisable genetic material, or a complete viroid, or a virus from scratch or even, as has seriously been suggested, a complete self-assembled prokaryotic or even eukaryotic cell. Yet probably all that is necessary to kick start life is any chemical configuration that self-replicates effectively, regardless of its size. But as yet we don't even know what the minimum and maximum number of base pairs is that would be able to sustain a viable organism.

The oft-quoted accusation made by creationists that science has yet to create life is a favourite straw man argument. The field of abiogenesis research is comparatively new (a little over 60 years of age) and because it's difficult to put any realistically applied spin on this sort of experimentation it doesn't attract much in the way of funding. Compare, for example, Harry Lonsdale's currently running Origin of Life Project distributing \$US2 million over seven years (though the largest grant is \$50,000 for one year), with the €11 billion start up cost for the European CERN project. Despite what is repeated in the popular press and in myriad creationist articles, and as any cursory reading of published work makes obvious, no experiment testing an abiogenesis related hypothesis is performed explicitly to create life of any kind. The quite reasonable goal is to recreate plausible single component biochemical pathways that may have led to biologically active chemistry. So it's not surprising, given the limited scope of each experiment, that life hasn't been created (despite what regular and often shamefully inaccurate press releases might suggest). But progress has been made. Indeed, two Nobel Prizes (Tom Cech in 1989 and Blackburn, Greider & Szostak in 2009) have been awarded for abiogenesis related research.

The two teams approach the race with very different tactics. While science is pro-active and conducts research into possible mechanisms of abiogenesis, the creationist approach is to sit back and pontificate in the negative about the quality and usefulness of this ongoing research. Nowhere do they offer plausible counter mechanisms for results obtained, or provide any novel data. When it comes to actual evidence, creationism is indefensible. The accepted method of engaging in science is to make observations, generate and test hypotheses, then present research findings at open scientific conferences and meetings, then to publish these data and findings in peer-reviewed journals, and finally to write textbooks. Creationists tend to blatantly bypass the first crucial stages. They prefer to publicise their views in closed meetings and in vanity journals or those journals affiliated to themselves that pay lip service to peer review and to write books aimed only at the general public and never the scientific community. Although a few proponents go to great pains to affect the trappings of scientific argument and debate, such as the intelligent design advocates, ultimately all creationists ever really achieve is planting doubts and sowing confusion in susceptible minds via the repeated assertion of *a-priori* derived views. The entirety of their evidence for supernatural creation can be summarised in three short words: God did it. This, of course, is merely a description and nothing remotely resembling an explanation or mechanism. No predictions are made as to what we might expect to observe given supernatural creation and would not expect to observe from a naturalistic process. Furthermore, creationists ignore, misunderstand and misrepresent much of the data obtained so far. Put simply, they have no alternative model on offer.

## The Lure of Big Numbers

In common with gamblers, creationists are impressed by big numbers. Their thinking seems to be that when probabilities are small the possibility of a process or event occurring always edges closer to God. A thorough literature review of creationist forays into the probability of abiogenesis occurring is beyond the scope of what I wish to accomplish here so a few representational (and by now highly clichéd) examples should suffice. Note, however, that often creationist calculations are not based on the scientific principles of abiogenesis but on the creationist notion of spontaneous generation. Rather than calculating the probability of the emergence of the simplest known self-replicating molecules, they invariably deal with complex protein structures, fully functional DNA and even complete cellular structures. In some cases there are deliberate misrepresentations of calculations completed by bona fide scientists who have no truck with creationism (for an overview see e.g., Carrier, 2004).

Such approaches are not merely an attempt to inflate the sample space and so their probability estimates. By acknowledging that simple molecules can evolve over time into more complex molecules and thence to a diversity of uni- and multi-cellular organisms, they would effectively be conceding the fact of common descent. This is not the type of thinking that young-earth creationists would want to encourage, though some old-earth creationists are perfectly comfortable with the validity of this field of science. Ironically, the uniquely creationist insistence on redefining the theory of evolution to include the origin of life includes an implicit acknowledgement of the success of modern evolutionary biology, for they now feel able to point to some phenomenon that the theory, and by extension science, cannot explain. They rely on the scientifically illiterate members of their audience not being aware of the enormous distinction between the development of self-replicating molecular structures and speciation.

Salisbury (1969) postulated that, if a 1000 nucleotide DNA molecule was the first biological entity, the odds of its occurrence would be 1 in  $10^{415}$ . We now know, of course, that much smaller RNA molecules are capable of self-replication and that molecules comprised of as few as 60 atoms are able to replicate. Obviously, any molecule that even occasionally copies itself, regardless of its size, has a huge advantage over molecules that cannot replicate. Coppedge (1973) later calculated the probability of the formation of the (then) smallest known living organism comprised of 239 proteins, with an average of 400 amino acids per protein, to be  $1/10^{8318}$ . Note that he bases this calculation on an extant organism that has undergone billions of years of evolutionary change and not the smallest possible protein that can exist in a self-replicating system. He assumes that this is the minimum level of biological complexity required for life to have started because, incredibly, he states that we have no reason to suppose that smaller organisms than we currently observe have ever existed! Morris (1974) claimed that the odds of a 'chance' arrangement of a specific 100 amino acid chain are  $1/10^{158}$ . Why the emergence of life would consist of the initial chaining of 100 specific amino acids is not discussed. In an oft quoted estimate, Hoyle and Wickramasinghe (1981), arguing for panspermia rather than creationism, reported that the probability of the random formation of 2000 specific enzymes  $1/10^{40000}$ . They provide neither detailed data nor equations but simply a conceptual outline of the calculation. A particularly ludicrous calculation is that attempted for the spontaneous assembly of the *Escherichia coli* bacterium by Ludwig (1993). Unsurprisingly, he calculates the odds of the spontaneous assembly of such a complex organism as enormous, somewhere between  $1/10^{2300000}$  and  $1/10^{3000000}$ . No credible scientist has ever hypothesised abiogenesis resulting in a fully functional DNA-based complex genome; it is a travesty that there remain creationists who consider that this should be considered a plausible finish line.

We are only ever able to calculate probability on the basis of a predicted or observed result (an event) compared to all possible outcomes (or sample space). So for a coin toss the probability of heads is  $1/2$  (1 being the event and 2 being the possible outcomes or sample space). For a roll of a die the odds are  $1/6$ . We know this because we know how many sides a coin and a die have and we are able to identify the content of each side and the relationship between the sides. Without this information we would have no way of knowing how many possible outcomes exist and so be unable to calculate any realistic probability, even when a result is known. Thus, when creationists proffer probability calculations that supposedly dispute abiogenesis they are, in effect, claiming to know both the both the event and the sample space, i.e., they claim to know all of the chemical, geological, meteorological etc variables present on Earth about 4 billion years ago. This is a completely impracticable. Life itself has altered the planet's chemistry and geology in ways we don't fully understand. Soil, at least as we know it, would not exist if it wasn't for the millions of species of worms, plants, insects, bacteria and fungi that live and die within it. Bear in mind, too, that for abiogenesis to be demonstrated an early Earth scenario is not necessary. Any scenario will do.

Creationist calculations are also predicated on a fundamental misunderstanding of the nature of random events. Probability estimates are predictions as to what will be observed in the future, not what we have actually observed. So low probabilities do not

formally equate to a lack of observation and certainly do not justify any claim that an event is impossible. Regularly observed events are commonly calculated to be highly improbable and considered totally unremarkable when they do occur. Indeed, no matter how low the probability we can be certain that one possibility in the sample space must occur. Why then be incredulous as to the result? The fact that life exists is no evidence for anything other than our certainty of its own existence.

To illustrate this reasoning, let's look at a few examples of the actual probabilities of commonplace occurrences. Assuming a truly random shuffle, the probability of observing any particular sequence of 52 playing cards (i.e., the ratio of an actual shuffled sequence to the sample space of all possible shuffled sequences) is

$1/8065817517094387857166063685640376697528950544088327782400000000000$  or  $8 \times 10^{67}$ . To put this into some perspective this figure is far larger than all the observable stars in the universe which is about  $7.7 \times 10^{21}$ . This is essentially how creationists erroneously portray the probability of abiogenesis; likening it to the extremely low probability of obtaining a specific 52 card sequence after a single shuffle. The probability of any randomly selected bridge hand being dealt is also far larger than all the observable stars, being  $1/53644737765488792839237440000$  or about  $5.36 \times 10^{28}$ . Already we are approaching the numerical territory that creationists argue must be evidence for a supernatural origin of life, yet we are doing no more than playing a very ordinary game of cards.

Now imagine dealing four separate 13 card hands from a standard shuffled deck. It would surprise many people to know that the probability of getting any random 13 card hand is  $1/635013000559600$  or a little more than  $6.35 \times 10^{14}$ . So what are the odds that we would be dealt a hand which, like the emergence of life, is very special indeed? Let's say a hand comprised of all 13 diamonds? Well, again it surprises many people to realise that the odds of this occurring are no different to being dealt any random 13-card hand. Playing cards, like atoms, are not conscious. The origin of life, like that very special hand of cards comprised of the full suite of diamonds, appears to be far less probable than any other random permutation of cards and molecules only because we have assigned some subjective significance to them. This is a well studied psychological phenomenon; humans tend to perceive certain naturally occurring patterns as being particularly significant and so perceive them as less likely to be observed, while viewing other patterns, though just as likely to occur, with much less significance and so considered more likely to be observed (Rogers, 1998). This is essentially what creationists are doing. Yet the pack of cards cares not which hands are dealt any more than do molecules, either now or 4 billion years ago.

Very low probabilities are also observed in chess. Across 64 squares, each player is restricted to starting the game with 20 possible moves. Yet, after each player has made only four moves the probability of that particular permutation of play is  $1/200000$  or  $2 \times 10^5$ . After ten moves each that figure rises to  $8.35 \times 10^{28}$ . The total possible permutations of games of chess that could be played is as high as  $10^{120}$ . When numbers as large as these are regularly observed in the most mundane of circumstances, the low probabilities quoted by creationists for abiogenesis no longer seem to hold the consequence they have been assigned. Indeed, if we applied creationist logic regarding low probabilities to human reproduction it is easy to prove that the probability of any particular individual human being (or any individual organism for that matter) actually existing is well nigh impossible. We are each created from two parents who supply one egg per month among hundreds and one sperm among 300-500 million per ejaculation. The odds of that single egg and single sperm being united is beyond infinitesimal. When we consider that those same odds have been repeated in every pairing of our genetic ancestors the multiplied probabilities become as miniscule as impossibility.

### **The Lure of Independent & Consecutive Trials**

It would be highly unlikely to expect that the chemical conditions harbouring the initial processes of abiogenesis occurred on one occasion or even in a single location on the early planet. It is more realistic to assume there were plentiful opportunities for billions of chemical reactions occurring simultaneously in countless billions of locations across hundreds of millions of years, not just on a single planet, but within the universe. A typical image from the Hubble telescope isolates about 10 square arc minutes of the sky and there are approximately 5,000 galaxies visible in such an image. The observable universe covered by the Hubble telescope (which is not the entire universe) therefore contains about 75,000,000,000 galaxies (see e.g., Plait, 2016). Our own galaxy, the Milky Way is, conservatively estimated, comprised of something like 100,000,000,000 stars (more generous estimates suggest the number is 4x higher). Let's assume that the more conservative figures are correct. We can then conservatively calculate:

$$n(\text{stars in universe}) = n(\text{galaxies}) \times n(\text{stars within an observed galaxy})$$

This gives us 7,500,000,000,000,000,000,000 or  $7.7 \times 10^{21}$  stars within the universe.

Creationists are therefore grossly ignoring the reality of concurrent, parallel processes. They assume that the chemical events underlying abiogenesis do not occur in the rest of the universe; that abiogenesis required an all-at-once single chemical event or a single instance of a series of events that has occurred on only a single planet orbiting a single star in a single galaxy. Yet we currently have no way of knowing whether any such hypothesised events on this planet is a rare exception or a wholly expected outcome. There may be nothing special about Earth in this regard.

Bear in mind that the 'astronomical' probabilities in chess emanate from a game containing only 32 distinct pieces occupying an area of activity of approximately 0.23 square metres. Our planet has a surface area of 510,072,000 square kilometres. To add more perspective: a single kilogram of the amino acid arginine, a component of mRNA, contains  $2.85 \times 10^{24}$  molecules. Who would even attempt to hazard a guess as to how many kilograms of arginine were available on Earth billions of years ago? We know also that arginine is found beyond Earth and has arrived on Earth from space. If everyone currently alive ( $6 \times 10^9$ , i.e., less than the molecules in a kilogram of arginine) randomly shuffled a deck of cards a billion times a year for a billion years, we would not expect to see the exact same sequence repeated. How many permutations would be possible then from simultaneous chemical interactions involving billions upon billions of protein precursors on the early Earth? No-one could possibly calculate this. It would be incalculable beyond imagination. The type of magnitude that 'infinity' was invented to deal with. But on numbers alone we can be sure it would be far higher than the single event process used to concoct creationist probabilities for abiogenesis. Yet creationists would have us believe the opposite; that there would not have been enough interactions in the time required to have encountered those permutations that would have been necessary for abiogenesis. This is analogous to claiming that only one game of chess has ever been played or that a single game of chess could only be played at any one time.

Simultaneous processes not only increase the probability of an event occurring, they also hasten the process. For example, if it takes 15 seconds for one person to toss a coin and record the result it would take an average of eight minutes (i.e., 32 tosses) to achieve four heads in a row. However, if 16 people simultaneously tossed coins at the same rate we would realistically expect four heads to occur within the first minute. Similarly, to obtain any particular coin tossing sequence with a probability of 1 in 1000000, we need simply get 1000000 people to simultaneously toss a coin the number of times necessary to fulfil the desired sequence. Statistically, we can predict that the desired sequence will occur. Even if we reduced the number of coin tossing people considerably, probabilities still remain feasible. For example, if only 10 people (i.e., 0.001% of the original 1 million coin tossers) were used the probability of getting the desired sequence is only increased to  $1/100000$  or  $10^{-5}$ . This simply means that, statistically, these ten people *might* have to toss the required number of coins 100000 times before the desired sequence is obtained. If they had hundreds of millions of years to do that it would not be a problem. Theoretically, of course, the desired sequence could even be attained on the first run. The dice will land however they land. They care not for human ideals.

### **The Lures of Random & Chance**

Another important facet ignored by creationists is the distinction between theoretical outcomes and actually realisable outcomes. Although creationists are fond of couching the debate in terms of God vs. chance or random luck, in reality there is no such binary choice. It is an argument from a false dichotomy. The behaviour of molecules does not occur randomly. Molecules are constrained to follow distinct physical rules of chemistry, just as the behaviour of chess pieces is constrained by the rules of chess. When calculating the probability of say, assembling a complex protein chain, many creationists ignore this distinction and include all possible molecular permutations, including those that are not physically realisable, thus artificially boosting their probability estimate. This is akin to having a chess board with all the pieces but being allowed to move those pieces in any way one chooses without being restrained by rules. The number of possible permutations would become far higher.

An example of a more realistic natural process can be found with snowflakes. Each snowflake's highly intricate pattern is unique. In a comprehensive study of the variety of snowflake formation (Bentley & Humphrey, 1962; including over 2000 high resolution photographs of individual snowflakes) it was calculated that the probability of any particular snowflake structure with a six-sided symmetry assembling all-at-once by 'chance' was approximately 1 in  $10^{2500}$ . Of course, like complex biochemical structures, snowflakes do not assemble in a single all-at-once event but are the product of a series of discrete steps, each of which builds on previous steps, subject to the laws of physics and chemistry. The sample space is obviously smaller at each step so higher probabilities result at each intermediate step. Thus, the probability of a whole snowflake forming via a number of discrete steps is obviously much higher than the probability of a snowflake forming in a single step.

By assuming that life initially emerged in the form of complex biochemistry creationists ignore the fact that, like snowflake formation, subsequent probabilities of specific biochemical events occurring would decrease once the first stage of self-replicating molecules is realised. Again, this can be exemplified with a pack of cards. Let's use the analogy that for life to emerge by physical means we must first be dealt all the suits in their ascending order, first diamonds, then hearts, followed by clubs and finally spades. When not claiming an all-at-once scenario, this is how creationists picture abiogenesis, as a serial sequence with exceedingly low probability, calculated by multiplying low probabilities at each step as if they were independent of each other. As mentioned earlier the possibility of encountering an ascending four suit sequence is 'astronomical', in fact  $1$  in  $8 \times 10^{67}$ . So we shuffle the cards, reveal the top card, and find it is not the required ace of diamonds. We then return the card to the pack and shuffle again and repeat the procedure until we get the ace of diamonds. As there is no longer any need to search for this card, it is effectively removed from the sample space. We then repeat the shuffling and card picking until we have the two of diamonds. There is now no longer any need to search for either of these cards and so the sample space decreases again. And so on, until the desired 52 card sequence is obtained and life has emerged. Employing this natural technique the average number of shufflings needed to obtain the desired sequence is no longer  $1$  in  $8 \times 10^{67}$ . It is  $1/1400$  or  $1.4 \times 10^{-3}$ . And this is assuming a single person shuffling the deck of cards to obtain the sequence. With enough people shuffling cards in parallel the probability that we would achieve the desired sequence in 52 shuffles would approach certainty. This is somewhat akin to the selection process found in nature, though in nature the end result cannot be specified beforehand but observed *a-posteriori*.

Once self-replication has been achieved, the behaviour of the molecules involved would be subject to and fashioned by natural selection and other evolutionary principles. Natural selection does not involve random reshuffling of either chemistry or genetic material. The essence of the mechanism is that mutations in biochemical material in tandem with environmental exigencies make some outcomes far more probable than others. There is certainly a chance element, such as point mutations, but natural selection itself is not an algorithm governed by chance (though some other known evolutionary mechanisms are, such as genetic drift). This two part process of mutation and selection has both random and non-random elements so the result is a biased rather than random process. If an evolutionary pathway does not work out there is no reason why other chemically legitimate pathways will not be explored. Oftentimes, even a 'near hit' from some optimal configuration is biochemically functional. It is important to remember that natural selection has no teleological element; it is never goal-directed. Thus, the sequence of events that has culminated in the diversity of life that we observe today could have unfolded in a completely different fashion. There is no way of predicting *a-priori* where such a process might lead. But that does not mean the process is solely governed by chance or randomness. It remains rule-bound.

### **The Lure of the Fallacy of Composition**

Creationist views on the origin of life are based squarely on the 'fallacy of composition' in which it is assumed that what is true of the whole must also be true of the parts that make up that whole. Creationists observe that molecules themselves are not alive, yet they comprise the constituent parts of a living organism. Therefore, they surmise, some other ingredient must have been added to the mix to confer life to the whole. However, we can readily observe examples where the whole has emergent properties not found in its constituent parts. A hydrogen molecule, for example is not wet and neither is an oxygen molecule. Using creationist logic, therefore, water should not have the physical characteristic of being wet without having supernatural input. Similarly, atoms have no colour. Flower petals are made entirely of atoms. Therefore petals must only exhibit colours due to their supernatural input. Agreeing that examples such as these are indeed true but 'life' is somehow different is merely an attempt at special pleading.

### **The Lure of the Fallacy of False Equivalence**

The fallacy of false equivalence is applied by creationists to the emergence of life whenever they invoke Louis Pasteur's so-called 'Law of Biogenesis' (*omne vivum ex vivo* or 'all life is from life') which states that because all the living organisms we observe originate from other living organisms the very first life forms must also have originated from some form of life. It is claimed that this form of life is one that we cannot observe, i.e., a being not within the physical realm and so supernatural. The view is misguided for a number of reasons. First, the 'law' is not a recognized scientific principle. Second, the 'law' was formulated as a result of Pasteur's failure to observe the creationist notion of spontaneous generation in his experiments. Third, there is no corresponding scientific law that prohibits abiogenesis. Fourth, it's akin to arguing that because all airplanes need a pilot in order to fly, a bird needs a pilot too.

It is also a mistake for creationists to assume that because only one possible mechanism exists to explain the origin of life (whether it be abiogenesis or supernatural creation) then that mechanism must necessarily be observed only once or, at best, extremely rarely. Coalescence is the only known mechanism for the formation of stars yet the process has happened trillions of times and still occurs.

### **The Lure of the Single Planet**

If creationists don't have enough information about early conditions on our own planet to adequately calculate a probability estimate for abiogenesis, how can they adequately assess the probability of abiogenesis having occurred (or is now occurring) on the countless other planets in the trillions of solar systems comprising the 100 billion + galaxies of which we're aware? As the writer Douglas Adams reminded us:

*"Space is big. You just won't believe how vastly, mind-bogglingly big it is."*

If anything is immune to hyperbole it is probably a description of the size of our universe and in that universe we currently have a sample of one solar system. As discussed, to argue against the possibility of abiogenesis creationists must assume that life has only ever emerged on this planet. This is by no means certain. A finding of life arising elsewhere would provide strong evidence for abiogenesis. This life need not even be based on known chemistry; it may contain no amino acids and not be based on RNA/DNA. So far, however, our attempts at finding life on other planets have been likened to occasionally blindly shooting a harpoon into the oceans and never catching a fish. Some creationists have attempted Bayesian calculations demonstrating the low probability of life existing in other solar systems (e.g., Aviezer, 1990) while others are content to assert from scripture that life exists only on Earth (e.g., Faulkner, 2009). Any probability assessments for or against life on other planets based on our current knowledge of the universe are likely to be awry. We simply don't have enough information to make these estimates. What is noticeable, however, is that they often attempt to stack the deck, by conflating the probability of any life-form with the probability of life at least as technologically advanced as ourselves. To demonstrate abiogenesis, however, would probably require no more than observing the natural emergence of a systematic ability of self-replication and some reliable mechanism of heritability.

### **The Lure of the Single Universe**

If creationists don't have enough information about our own universe to adequately calculate a probability estimate for abiogenesis, how can they adequately assess the probability of abiogenesis having occurred (or be occurring) in other possible universes? How can they know that ours is the only possible universe? To correctly calculate their odds they have to assume that life has only ever emerged on a single planet in a single solar system, in a single galaxy in a single observed universe. Just as there are billions of galaxies in our universe, there could be billions of universes, each with their inhabitants offering the same fundamentally flawed probability calculations for the emergence of life as do human creationists.

It is pertinent here also to briefly discuss the heavy creationist reliance on the fine tuning argument. Certainly, life appears to require some hospitable range of physical constants and certainly the universe does manifest that range of physical constants. However, it is demonstrably obvious that the vast bulk of the universe does not and very probably cannot contain life. Although advocates of fine tuning do not claim that the entire universe should be hospitable for life it remains that to observe life on one planet out of trillions and conclude that this state of affairs is evidence of the purpose of the universe is speculative at best. The argument relies on prioritising such subjective values and collapses entirely if we take the view that the development of life is not the 'purpose' of the universe and may merely be collateral. Since the most abundant element in the universe is hydrogen we could just as easily argue that the universe is fine tuned to manufacture hydrogen.

There are also difficulties in assuming that fine tuning indicates supernatural causation. First, if the universe is physically fine tuned for life why then does life not emerge from a physical substrate by purely naturalistic means? Surely the claim that an omnipotent God needed to invoke a supernatural cause for abiogenesis suggests strongly that the physical universe is not fine tuned for life to emerge. Second, we have only ever observed one universe, so how can we judge it to be fine tuned for life? In the absence of any comparator universe, how can we be so sure that the universe we observe, along with its specific physical constants,

is not, in a software sense, horrendously clunky, bloated and inelegant, yet just 'good enough' to implement the life we observe? Perhaps it barely scrapes through in some cosmic grading of universe quality. Third, whether our universe represents the only combination of such physical constants that life could possibly emerge from is by no means settled. Fourth, if the universe was finely tuned for life wouldn't it be reasonable to expect to see finely tuned life forms commensurate with their finely tuned environment? Yet we definitely don't. What we observe are life forms that are 'good enough' to survive in specific environments and never optimal for that environment. This suggests two things. The life forms we observe have emerged and evolved to fit into their environment and not vice-versa and/or the universe may indeed be fine tuned for life, but not the life that we actually observe; some other forms of life within the universe may be the goal.

What of the probability of fine tuning? Once again, it is worth mentioning that creationists offer no quantifiable definition of what fine tuning is. How is it possible, without some reliable metric, to identify a finely tuned universe from a less finely tuned or coarsely tuned universe? (see Manson, 2000 for discussion on this point). It can also be cogently argued that creationists have their claim logically reversed. If we compare the competing hypotheses that (i) the universe has been designed for life by means of specific physical constants (and the observation of our own existence) vs. (ii) a naturalistic universe has unfolded with specific physical constants (and the observation of our own existence), we can argue as follows: If we are living in a naturalistic universe then our observation of our own existence carries a probability of 1 and this fact implies that we are also able to observe the physical constants that permit our existence, again with a probability of 1. Note that the probabilities claimed here are that we have actually observed these states of affairs; they are not the probabilities that these states of affairs actually exist compared to all potential states of affairs. Although we can be certain that we actually observe these states of affairs it does not follow, of course, that they are not, in themselves, highly improbable.

Thus the hypothesis that we are a supernaturally created life form living in a supernaturally created universe can neither undermine our actual observations nor the naturalistic hypothesis because the probability of our observing supernatural creation can only be equal to or less than 1 and not any higher. However, if we are a supernaturally created life form existing in a supernaturally created universe then the values of the specific physical constants that foster life should be inconsequential. Although life would only be able to exist in a naturalistic universe if the physical constants were conducive to life an omnipotent God would not be so constrained. An omnipotent God could create a universe where the physical constants are not conducive to life yet we still observe ourselves as existing. Such a scenario would certainly be compelling evidence of a supernatural origin to life. Because we can be certain that we are not living in such a universe then the probability that we actually are a supernaturally created life form existing in a supernaturally created universe necessarily drops to less than 1 and the naturalistic hypothesis is favoured.

### **The Lure of the Wager Revisited**

Let's assume for the moment that creationists are actually able to calculate the true probability that life emerged by natural means. Let's assume that number is so 'astronomical' as to be almost impossible. What would that tell us other than providing some number? Recall that a probability estimate is a predicted or observed result compared to all possible outcomes. Imagine you knew nothing whatsoever about temperature and I told you that it was currently 32.5 degC in the shade here and 22.5 degC in the shade over there. Those figures would be meaningless to you unless you had a context in which to place it. If I then told you that water froze at 0 degC and boiled at 100 degC you would have some context in which to make a relative judgement. The only context we have when it comes to the origin of life is that physical processes are ubiquitous throughout the universe and life exists on this planet. We don't *know* that supernatural events or processes exist. Indeed, all prior examples of supernatural activity that have been investigated methodically are characterised by their having been falsified.

No matter how improbable they calculate abiogenesis to be, to put that figure into any type of context creationists need to demonstrate that the probability of a supernatural creation event or process is higher than the probability of abiogenesis (or any other suitable hypothesis) to a statistically significant degree. Determining a probability for supernatural creation is inevitably going to be a calculation characterised by a massive divide by zero error. However, they don't even consider that they need a comparator calculation because they have already assumed the certainty of supernatural creation. It is their default position. But if you can't realistically determine the probability of a physical event having occurred 4 billion years ago, how do you go about determining the probability of a supernatural event occurring at the same time? Or in the case of young earth creationists, some 4 billion years later? And even if creationists could show that a supernatural causation for the origin of life was indeed more probable than a naturalistic causation, we would still not know that it actually happened. We live in a universe where we regularly observe

improbable events occurring despite the existence of more probable alternatives. Just ask any gambler.

Creationists have hoisted themselves by their own petard because they now have a further, far more onerous and futile calculation to perform. If we expected someone to base a probability calculation on an unknown sample space they would rightly think it was ridiculous endeavour. Yet the creationist view is predicated on exactly that; that there exists a supernatural being capable of, and having the volition, to produce a supernatural life creation event. So in addition to calculating the probability of a supernatural event they need to calculate the probability of the existence of God or the 'particles', or whatever it is, that constitutes God. Simply asserting that God is not made of particles, or whatever, or has existed eternally is pure theological speculation. It does not address their problem and it does not act to effectively refute the naturalistic view.

The naturalist hypothesis is simply that life on Earth emerged from a non-living physical system. That's all. There is no need to posit further explanatory baggage as to why that might be so. It is beyond the hypothesis. While a supernatural agent originating outside our physical realm might be a logically sufficient condition to create life, there is no evidence that it is a necessary condition for the emergence of life from non-life once a physical system is established. There's certainly nothing logically incoherent, for example, to postulate a God who has created a physical realm, but never bothered to create life, yet has nonetheless observed its emergence within that physical realm. We might also be living in a universe designed by sentient beings like ourselves, subject to the laws of nature but with a far superior understanding of how to manipulate them. Such beings could manifest events or processes that accord to our known physical laws, or they could manifest events and processes that temporarily bypass our known physical laws. In the second case, a supernatural event would appear to have occurred, though in reality it would be wholly physical. We should not assume anything beyond our ability to investigate and certainly not jump to the conclusion that whatever is currently unexplained must, by philosophical fiat, be both supernatural and causative.

Were I to have a flutter on this particular horse race, I know where my risk-averse money would go. Not because of faith or because of any deep seated emotional or cognitive bias or any gambler's heuristic – the results of scientific investigation are ultimately not amenable to chance – but because methodological naturalism really does appear to be revealing true things about our universe. But perhaps the race will never end. Perhaps the deepest past will keep its secrets. In which case neither horse wins. If we are honest, we will accept that situation, which would mean we wouldn't consider something to be true merely because it has yet to be proven false. So, while I would continue to maintain the view that supernatural causation *probably* did not occur I doubt creationists would be willing to join with me. I suspect they will continue to assert that supernatural causation *definitely* did occur. Gamblers tend toward optimism rather than realism.

## References

Alcock, J.E. (2003). Give the null hypothesis a chance: Reasons to remain doubtful about the existence of psi. *Journal of Consciousness Studies*, 10: 29-50.

Augustine. *De Genesi ad Litteram*. Book II, xviii, 37.

Aviezer, M. (1990). *In the Beginning: Biblical Creation & Science*. Jersey City, NJ: Ktav Publishing.

Aviles, J.M., Whelan, S.E., Hernke, D.A., Williams, B.A., Kenny, K.E., O'Fallon, W.M. & Kopecky, S.L. (2001). Intercessory prayer and cardiovascular disease progression in a coronary care unit population: A randomized controlled trial', *Mayo Clinic Proceedings*, 76: 1192-1198.

Benson, H., Dusek, J.A., Sherwood, J.B., Lam, P., Bethea, C.F., Carpenter, W., Levitsky, S., Hill, P.C., Clem, D.W., Jain, M.K., Drumel, D., Kopecky, S.L., Mueller, P.S., Marek, D., Rollins, S., & Hibberd, P.L. (2006). Study of the Therapeutic Effects of Intercessory Prayer (STEP) in cardiac bypass patients: a multicenter randomized trial of uncertainty and certainty of receiving intercessory prayer. *American Heart Journal*, 151: 934-942.

Bentley, W.A. & Humphreys, W.J. (1962). *Snow Crystals*. NY: Dover Publications.

Carlson, S. (1985). A double blind test of astrology. *Nature*, 318: 419-425.

- Carrier, R. (2004). The Argument from Biogenesis: Probabilities against a natural origin of life. *Biology & Philosophy*, 19: 739-64.
- Coppedge, J.F. (1973). *Evolution: Possible or Impossible*. Grand Rapids, Michigan: Zondervan.
- Faulkner, D. (2009). Can life exist on other planets? *Acts & Facts*, 38: 18-19.
- Gonzalez, G., & Richards, J.W. (2004). *The Privileged Planet: How Our Place in the Cosmos Is Designed for Discovery*. Washington DC: Regnery Publishing.
- Hoyle, F. & Wickramasinghe, N.C. (1981). *Evolution from space: A theory of cosmic creationism*. London: Touchstone.
- Kelly, I. (1998). Why astrology doesn't work. *Psychological Reports*, 82: 527-546.
- Ludwig, M. (1993). *Computer Viruses, Artificial Life and Evolution*. Tuscon, AR: American Eagle Publications.
- Manson, N.A. (2000). There is no adequate definition of 'fine tuned for life'. *Inquiry*, 43, 341-352.
- McGrew, J.H. & McFall, R.M. (1990). A scientific inquiry into the validity of astrology. *Journal of Scientific Exploration* 4: 75-83.
- McKay, B., Kalai, G. & Bar-Hillel, M. (1999). Solving the Bible code puzzle. *Statistical Sciences*, 14: 2150-173.
- Morris, H.M. (1974). *Scientific creationism*. Green Forest, AZ: Master Books.
- Plait, P. (2016). *A hundred billion galaxies*.  
[http://www.slate.com/blogs/bad\\_astronomy/2016/04/07/hubble\\_image\\_of\\_galaxies\\_in\\_sculptor\\_implies\\_100\\_billion\\_galaxies\\_in\\_the.html](http://www.slate.com/blogs/bad_astronomy/2016/04/07/hubble_image_of_galaxies_in_sculptor_implies_100_billion_galaxies_in_the.html)
- Rogers, P. (1998). The cognitive psychology of lottery gambling: A theoretical review. *Journal of Gambling Studies*, 14, 111-134.
- Salisbury, F. (1969). Natural selection and the complexity of the gene. *Nature*, 224: 342-343.



All original images and written content are copyright © Gary Hill 2015. All rights reserved. Not in public domain. If you wish to use my work for anything other than legal 'fair use' (i.e., non-profit educational or scholarly research or critique purposes) please contact me for permission first.

---