We Have No Excuse
A Scientific Case for Relating Life to Mind

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*"We call these [mutation] events accidental; we say that they are random **occurrences**. And since they constitute the only possible source of modifications in the genetic text, itself the sole repository of the organism's hereditary structures, it necessarily follows that chance alone is at the source of every innovation, of all creation in the biosphere.* (Jacques Monod)[2]

Many in science employ a dogma that life is related to matter, rather than to mind.

The dogma seems conceptually flawed. Unlike rocks, rivers, wind, rain and snow, life operates on information - tightly integrated messages that function to order a grand symphony of future events for clearly evident purposes. Lacking a mind, matter simply can't comprehend or order future events for a purpose. Because purpose only derives from mind, logic seems to demand that life is related to mind rather than just to matter.

Lacking a mind, material causes have only two tools to work with: (1) physical and chemical necessity flowing from the properties of matter, energy and the forces and (2) chance. As implied by Monod's statement, physical and chemical necessity are not tools used to order the symbol sequences that make life. Hence, the heavy lifting is left to chance by default.

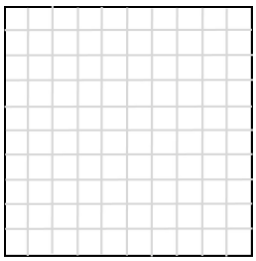
The chance default is considered adequate because it is endowed with seemingly gargantuan resources consisting of billions of years of time and countless opportunity. The purpose manifested by life is only "apparent" and not objectively real because chance can explain it. For the materialist, the purpose apparent in the messages of life is just an illusion, like the illusion of a rising sun in the morning.

This article explains why Monod is wrong and the claim of chance fails. It fails because probability decreases exponentially at an accelerating rate as the complexity of a system increases only incrementally. Because of the phenomenal rate of reduction even billions and billions of years of time and opportunity are not adequate for chance to mimic the simplest functions of life.

If chance is not adequate to explain life, given the absence of chemical necessity for its purposeful character, it seems we have no excuse for not relating life to mind, rather than to matter.

A Game of Relationships (a vignette illustrating the implausibility of functional relationships arising by chance).

Today is a great day because Maggie is visiting. Maggie is your five year-old grand daughter. She brings with her a new game her dad gave her called "***Relationships***." The game includes an easel that you set up in the family room. It also has a white metal drawing board that sits on the easel. The board is ten inches square and is divided by very faint white lines into 100 squares.



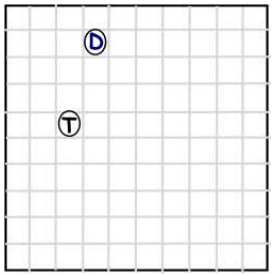
The metal board is magnetic.

Hanging below the cross bar of the easel is a box. Inside the box are little metal discs.

Painted on each disc is an upper case or lower case letter of the 26 letter alphabet, a period, a comma or a question mark. Thus, there are 55 different symbols in the box. With these symbols one can make all manner of patterns.

A little machine is attached to the box. Every six minutes the machine randomly pulls a disc out of the box and randomly puts it on one of the 100 squares on the drawing board. After it does this it replenishes the box with a like copy of the placed disc so the box always has a full set of the 55 letters and punctuation marks.

Because the board is magnetic, the iron discs stick without falling to the floor.



You and Maggie turn the machine on and watch it draw the letter "D" and put it in row 2 of column 4.

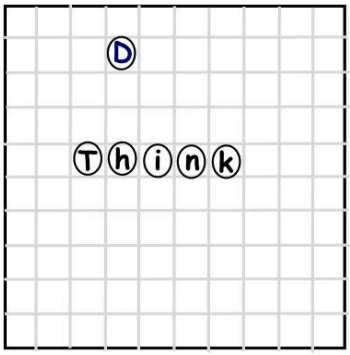
You then retire to the kitchen for some milk and cookies. A few minutes later, you go back to the family room and see that there is now a second letter on the board. A letter "T" is in row 5 of column 3.

Dependent Physical Relationships. The point of the game is to describe the relationships that appear on the board. So, you and Maggie start looking for relationships. You find that there is a dependent or necessary relationship between the discs and the magnetic board. In other words, if you put a disc close to the board an electromagnetic force contained in the atoms that make up the board strongly attract the atoms that make up the iron disc. But if you release the disc before it gets too close to the board it will be pulled by the gravitational force to the ground. So, you conclude that the discs are related to the board by chemical and physical necessity. Stated another way, the relationship of the letter D to the board is ***dependent*** on the electromagnetic attraction of the board. The combination of the metal properties of the discs and the magnetic property of the board produce this "necessary" or dependent relationship between the board and the discs. If the discs were made of wood they would not stick. Instead, you would find them scattered on the floor unrelated to the board.

Independent relationships. Maggie likes playing with the magnets, but is getting bored. So, you ask her if there is a relationship between the letters themselves. Is the letter "D" related to the letter "T"? Both are related to the board. But, are they related to each other? You show Maggie how there is no physical or chemical necessity for D to be in row 2 of column 4 or for the T to be in row 5 column 3. Also, there is no necessity for the "D" to be a "D" or the "T" to be a "T". They could easily be "A's", "c's" or "q's". Thus there is no physical, chemical or "***necessary***" relationship between the "D" and "T". It can also be said that "D's" relationship in space does not depend on "T's" relationship in space. They are ***independent*** of each other.

You also know that the machine is a random generator. It just pulls and puts symbols randomly. So, if the discs are related at all, it is simply a random or "chance" relationship. Their relationship to the board is necessary, but their relationship to each other is random.

Functionally dependent relationships. Maggie says she has had enough and wants to go out and play. So she goes outside and you go back to the kitchen to make a pie for dinner. After putting the pie in the oven, you stroll back into the family room to watch the news. Now you see a new pattern of letters on the board that spells "**Think.**"



With some surprise, you ask again - what is the relationship, if any between the discs? Although there is no physically dependent relationship between the "T" and the "D," there is a clear relationship between the "T" and each of the other four letters that comprise the word "Think." By themselves they are meaningless. Together the discs ***function*** to produce an event to occur in the future. The future event is the manifestation of the meaning symbolized by the command "Think." Once all five of the letters are assembled in that precise sequence there comes into existence a manifestation of meaning symbolized by the word "Think." That meaning is of course:

> "to employ one's mind rationally and objectively in evaluating or dealing with a given situation."

If any of the five letters were missing or on the wrong square the manifestation would not occur. Hence, all discs are related to each other by a non-physical intangible unique function. Although the discs are physical objects themselves, the function their relationship manifests is not physical. You also note that while the relationship between the discs and the board is necessary or dependent due to the charge on physical particles - atoms and electrons, the relationships between each of the letters in Think are physically independent, unified only by an intangible function.

"Function" is synonymous with "meaning," and "purpose,"

You ask, what can produce a "functional," "meaningful," or "purposeful" relationship?

Just as a magnetic relationship can derive only from an electromagnetic force, a purposeful relationship can only derive from a mind or some form of intelligence that has the capacity to ***think*** of it. Purpose, meaning or function can only be a derivative of thought. It is produced in the mind through the capacity of the mind to "know" the present, store that "knowledge" in memory, to "think" about that knowledge so as to "predict" the future and to then "choose" to alter the future for an intended purpose. The arrangement of matter, energy and the forces to achieve the purpose per the choice, becomes the manifestation of that immaterial thought or purpose born in the mind.

Material causes and random processes, which lack a mind, simply do not have the capacity to produce an intention in the first instance. Material causes cannot know or think. Hence, they lack the capacity to manifest thoughts they cannot have. They can't know the present, have knowledge of the past or choose to alter the future.
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Accordingly, if a function is manifested by a pattern consisting of physically independent elements, then it is reasonable to infer that a mind may have produced it.

Think of how a mind produces the future manifestation associated with the word "Think." The mind orders a sequence of steps integrated to manifest a function that does not come into being until all the steps have been taken. For example, the first step in the production of the manifestation of a command to think is to generate the letter "T." That step alone is not sufficient to produce the manifestation. A second step must also be taken - the placement of an "h" immediately to the right of the "T." But that does not produce the manifestation either. Three more steps are required. The future effect does not arise until the last letter is placed. The only cause that we know of that has the capacity to generate and then manifest a real intention is a mind.

Minds order events for a future purpose. They order patterns that will command, inform, assemble, build, enable, excite, please, transport, house, nourish, and destroy. Each manifestation of a mind is preceded by a set of steps. The steps often reveal the ultimate intention of the mind, but not always. One does not know the true intention of the minds that built Stonehenge. However, one may know that it was produced by a mind or minds for a purpose. One may not know the purpose of a homicide, although one may reasonably infer that it was a homicide. The inference to a mind arises from the clues left behind by the mind - the physical steps that had to be taken to produce the intended non-physical function or effect.

The name we often ascribe to a pattern that manifests the intention of a mind is "information." Information is clearly carried in writings which serve to expressly reflect intentions. It is not always apparent in all mind produced patterns, such as works of art, ciphers, incomplete works or works that use an unintelligible language.

Who or what "done" it? So, when you see "Think" on the board you scratch your head and think. You are the only one who has been in the house since Maggie went out to play. If that is true, then no mind has been present to fiddle with the random generator. Perhaps the discs that spell "Think" are not a derivative of intention but are in fact just related by chance. Maybe the manifestation of meaning reflected in the sequence is just an illusion of a mind at work. If chance can explain the pattern, then you need not look for Maggie hiding in the closet.

You think chance ought to be a plausible alternative. After all, there are only five letters involved in the pattern. Chance ought to be able to account for such a short sequence. So you decide to calculate the odds to show how chance can explain the pattern and solve the mystery.

Calculating probability. Most of us let our intuition do probability calculations because it seems so difficult. But, the basics involve simple division and multiplication.

The probability (P) of the occurrence of a series of events comprising a pattern manifesting a particular function (F) is the number of opportunities or trials (T) for the pattern to occur divided by the number of possible patterns or outcomes (O) that could occur or PF=T/O:

$$PF_{\text{probability of function}} = \frac{T_{\text{number of trials for function}}}{O_{\text{possible outcomes}}}$$

A simple example would be the probability of the occurrence of a single event pattern consisting of a dot that could be produced by flipping a coin that has a dot on one side and a dash on the other. The probability of getting the pattern of single dot on one trial consisting of one flip is:

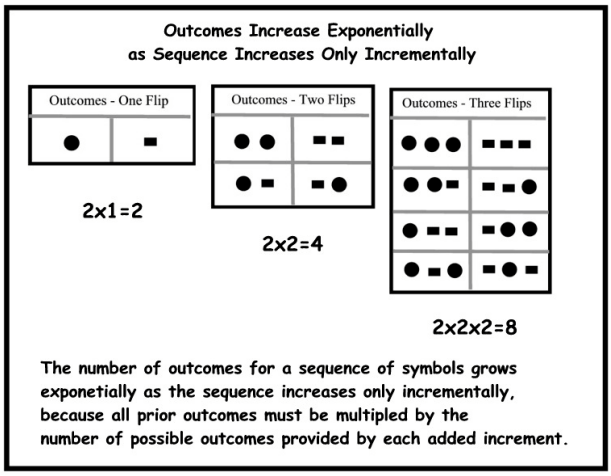
$$PF_{\text{probability of function}} = \frac{T_{\text{number of trials for function}} = 1 \text{ flip}}{O_{\text{possible outcomes}} \text{ (dot or dash)} = 2} = \tfrac{1}{2} \text{ or } .5$$

Suppose we want to know the probability of getting a more complex pattern - one consisting of a series of three dots in one trial consisting of three flips. Three dots symbolize the letter "S" in Morse Code language. Although we are flipping the coin three times, we still only have one trial because the function we are looking for consists of three related steps - three flips in a specific sequence. Hence, the numerator remains just 1, not 3.

Although the numerator remains 1, a crucial change occurs in the denominator. The number of outcomes or possible patterns in the denominator grows at an accelerating (exponential) rate as the complexity of the target pattern increases. The first flip makes possible two outcomes (dot or dash), the second four (dot dot, dash dash, dot dash or dash dot), and the third eight (2x2x2 = 8).

$$PF_{\text{probability of function}} = \frac{T_{\text{number of trials for function}} = (1 \text{ trial of 3 flips}) = 1}{O_{\text{possible outcomes}} (2x2x2 = 8) = 8} = 1/8 = .125$$

What we find is that the numerator remains constant at one, with each increase in sequence complexity requiring a *serial multiplication in the number* of the possible outcomes.



Suppose the desired function is the message "help" to be spelled out in Morse code language using three dots, three dashes and three dots. In this case, the number of trials remains one, but the nine steps needed to get to function requires nine flips of the two sided coin. Thus the number of outcomes provided by each flip, being 2, must be serially multiplied by each other so that the number of possible outcomes becomes $2x2x2x2x2x2x2x2x2 = 2^9 = 512$. So the probability is 1/512 = .0019.

The exponential increase in possible outcomes is illustrated nicely in the following example. Suppose a friend of yours, John, needs help. He is adrift at sea in a swamped raft and needs to be rescued immediately. Although the word "help" is functional or meaningful, it does not do the job. We also need the message to specify who needs the help. So we need a message that says "Help John" in Morse Code. The Morse Code for "John" is a dot and three dashes for "J," three dashes for "O," four dots for "H," and a dash and a dot for "N." This adds an additional 13 flips to each trial. So, now the total sequence needed in the message is 9 +13 = 22. The probability of getting the Morse Code sequence for "SOS John" in a single 22 flip trial is 1 over 2x2x2x2x2x2x2x2x2x2x2x2x2x2x2x2x2x2x2x2 2x2x2x2x2 or $1/2^{22}$ or 1/4,194,304. The math looks like this:

First 9 flips	=	1/512
Flip 10	= 2x512=	1/1,024
Flip 11	=2x1,024=	1/2,048
Flips 12-17.....……	=	1/131,072
Flip 18	=2x131,072=	1/262,144
Flip 19	=2x262,144=	1/524,288
Flip 20	=2x524,288=	1/1,048,576
Flip 21	=2x1,048,576=	1/2,097,152
Flip 22	=2x2,097,152=	1/4,194,304

Notice how probability declines at a ***rapidly decreasing rate*** due to the concomitant exponential increase in the number of outcomes.

Consider our earlier equation:

$$\mathbf{PF}_{\text{probability of function}} = \frac{\mathbf{T}_{\text{number of trials for function}}}{\mathbf{O}_{\text{possible outcomes}}}$$

The number below the line is important, because it tells you the number of trials you would realistically have to put in the numerator - above the line - to get to a probable outcome. If the denominator calls for 8 outcomes, then you need 8 trials for the event to be probable. If the denominator calls for 4 million outcomes you need 4 million trials. But what if you don't have enough time or resources to run 4 million trials? If you could do ten 22 flip trials in an hour it would take 48 years of constant flipping to expect a random generator to send a functional message that might get help to John. By then it would be too late.

So, armed with this basic knowledge of probability theory, you ask, what is the chance of the "T", "h", "i," "n," and "k" being pulled ***and*** then put in the correct positions in Maggie's 'Relationship' game? The number of possible ***pull*** outcomes consists of 55 since there are always 55 different letters in the box. The number of possible ***put*** outcomes are 100 since there are 100 different squares on which any letter may be placed. Thus, the number of possible outcomes for any ***pull-put step*** is 55 x 100 = 5,500. However ***five pull-put steps are required for one trial.***

The number of possible outcomes for one five step trial is 5,500 x 5,500 x 5,500 x 5,500 x 5,500 = 5,032,843,750,000,000,000. So the probability is one over 5 trillion trillion:

T:	1/5,500
Th:	1/5,500 x 1/5,500 = 1/30,350,000
Thi:	1/5,500 x 1/5,500 x 1/5,500 = 1/166,375,000,000
Thin:	1/5,500 x 1/5,500 x 1/5,500 x 1/5,500 = 1/915,062,500,000,000 (915 trillion)
Think:	1/5,500 x 1/5,500 x 1/5,500 x 1/5,500 x 1/5,500 = 1/5,032,843,750,000,000,000 (5 trillion trillion)

When does improbability equate to practical impossibility? As one looks at the gargantuan number – one over 5 trillion, trillion, one could argue that even with such low probability, it is still possible that "**Think"** just might appear on the first trial – its possible. But the question is, can we reasonably expect a chance process to produce a specified or needed effect ***within a given amount of time***. If not, then it is unreasonable for us to rely on the chance process to produce the effect.

In our example the robot is only pulling letters at the rate of ten an hour. Suppose the board is automatically cleared after each five pulls. Only two five sequence trials an hour are now permitted. To expect "Think" to arise by chance would take 2.5 trillion, trillion hours or 574 trillion years. The universe is only 14 billion years old. By adding trillions of robots we could maybe get within the age of the universe, but who would be around to "think," after the production of the message? Given these odds, it is not reasonable for us to attribute the apparently meaningful command of "**Think"** to chance rather than to a mind.

Imagine a safe cracker that has only six hours in the middle of the night to open the bank vault having a combination lock with 100 set points and a combination that requires the knob to be turned to three correct numbers in sequence. Each trial consists of three turns. The possible number of outcomes is 1/100 x 1/100 x 1/100 = 1/1,000,000. If it takes a minute to do each three turn trial, we could realistically expect the robber to take 16,667 hours to open the safe. He only has six. A combination lock could be made with 1,000 set points and require ten turns to the correct number. But, as a practical matter that extra degree of complexity is not needed. Combination locks reflect the amount of complexity needed to establish practical impossibility within a specified time.

Mathematician William Dembski argues that anything less probable than one over 10^{150} is statistically impossible as a practical matter. The number is based on the number of elemental particles in the universe (electrons, protons and neutrons) which is about 10^{80}, multiplied by the number of times an elemental particle changes state within a second, which is 10^{45}, multiplied by the number of seconds which have elapsed since the beginning of the universe, assuming it arose about a billion times 20 billion years ago, which is 10^{25} seconds ago (10^{80}x10^{45}x10^{25}=10^{150}). The number 10^{150} quantifies all of the time and opportunities – probability resources - available in the entire universe for any given sequence of past events to have occurred by chance. It represents the largest number that one could put in the numerator for any set of events within this universe. The number is helpful, because it can be used to assess whether it is reasonable to round the probability of an event to zero, as a practical matter.

For example, assume every elemental particle in the universe was a monkey flipping coins at the rate of 10^{45} flips a second. Could we reasonably expect them to produce a sequence

of heads and tails that would match the first sentence in Lincoln's Gettysburg Address in Morse code?

> "Four score and seven years ago, our fathers brought forth upon this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are ***created*** equal."

The sentence contains 177 letters, spaces and punctuation marks. It can be sent with a 577 symbol sequence of dots and dashes in Morse code. The probability is 1 over $2^{577,}$ which is the same as 1 over 10^{173}. Since the 10^{173} number is significantly less probable than the universal probability limit of 10^{150}, a reasonable person would not bet on the monkeys, even if they started flipping at the beginning of the universe.

As you return to the word "Think" on Maggie's game board and think of the odds of one over five trillion, trillion, you conclude that it is not reasonable to believe that the relationship between the five letters was ordered just by chance. While 1/5,032,843,750,000,000,000 does not exceed the $1/10^{150}$ discussed above, there just has not been enough time in the known universe assuming that the robot is pulling letters at the rate of ten an hour. You also know that physics doesn't order the sequence. Physics and chemistry can order the relationship between the discs and the board but they can't order the relationship between the discs themselves to require that they manifest the word "Think."

So, you think somehow Maggie must have snuck into the room and fiddled with the discs while you were making the pie. Isn't it amazing how smart a five year old grand child can be!

In summary, this vignette illustrates the inherent problem of attributing complex functional sequences to chance. As the complexity of the sequence increases, its chance probability decreases ***exponentially.*** Within finite realms, chance losses its plausibility with only small increases in complexity.

The ultimate relationship - Analyzing patterns that comprise life.

Many scientific disciplines that seek to determine the relationship of an existing pattern to past events analyze them as we analyzed the letters on the drawing board. Coroners seek to know the cause of a death - is the death related to a mind or a natural or accidental cause? Those searching for extraterrestrial intelligence seek to know whether a sequence of radio waves from outer space is related to an intelligent rather than a natural or accidental cause. Archeologists seek to know whether a hammer shaped rock got its shape from a mind or a stream.

Our analyses show that the determination of causal relationships involve three inquiries. First, does the pattern manifest a function or purpose - an effect to occur in the future, such as the meaning of the word "Think?" If not there is no necessity to infer a mind. Second, are the various components of the pattern related to or dependent on material causes driven by physical and chemical forces - by necessity? A snowflake looks designed, but its beautiful hexagonal symmetry simply reflects the way water molecules necessarily organize under certain conditions. If chemical necessity can explain the pattern, there is no necessity to infer a mind. Third, if a functional relationship reflected in the pattern is physically independent (not necessary like the

snowflake), can chance explain it? If not then a mind - an intention becomes the best explanation for the functional relationship reflected in the pattern. The methodology is explained with great precision by William Dembski in *The Design Inference*.[3]

The methodology for detecting the cause of a pattern is not controversial until one seeks to apply it to the patterns of life. A controversy arises because a conclusion that relates human life to a giver leads to profound implications. There is a difference between a gift and a found object. If one views one's life as a gift, then it is dependent on the mind of the giver. The recipient might be interested in what the giver wants the gift to be used for. However, if life is just a found object produced by a combination of physical and chemical necessity and chance, then one may do with it as one pleases. If life is a found object it is not dependent on a mind. It is simply the independent result of random interactions of matter, energy and physical forces.

Both conclusions provide the foundation for particular kinds of religion. This is because all religious beliefs depend on an origins narrative that explains the cause of life and its relationship to the world. This was explained by the US Supreme Court in *McGowan v. Maryland*, 366 U.S. 420 (1961), when it said "religion - in the comprehensive sense in which the Constitution uses that word - is an aspect of human thought and action which profoundly ***relates the life of man to the world in which he lives."***

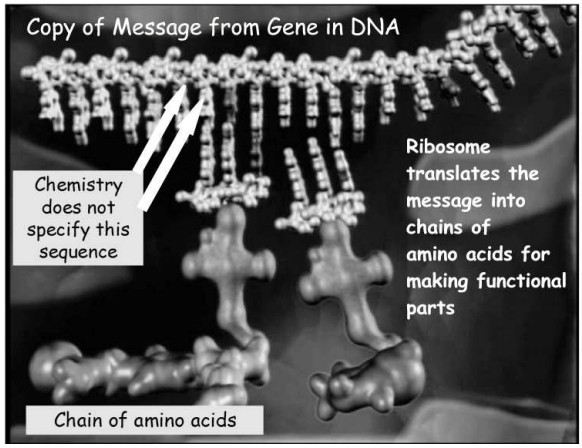
Is life a gift or a found object? Is it a creation or the chance occurrence that Jacques Monod contemplated in the opening paragraph of this paper? Based on belief about that issue, religions then address the subsidiary questions of the nature of life, how life should be lived and what happens when life on earth ends. Traditional theistic religions explain life as a gift. Non-theistic religions like Atheism and "Secular" Humanism explain it as simply the product of an accumulation of unguided material causes over time. The idea is that life just arises or occurs from materials of the past. These religions hold that life comes from matter, not mind.

Although controversial, investigations of modern science reveal patterns in nature that inexorably lead to the question about how life is related to the world. The data consists of patterns like the word "Think." Except the patterns that run life are not five letter sequences. ***They are functional messages that contain billions of symbols not ordered by chemistry.***

The data is forcing us to think seriously about the adequacy of chance to provide the answer. Mind is not an absurd alternative for the symphony of function observed in life. Intelligence is ubiquitous to the natural world. We see it in animals, birds, humans and even in cellular systems like the immune system. We are searching for it in outer space. Given the existence of minds, there is warrant for suggesting that our minds may be the product of another mind rather than a chance accumulation of random interactions of matter, energy and physical forces.

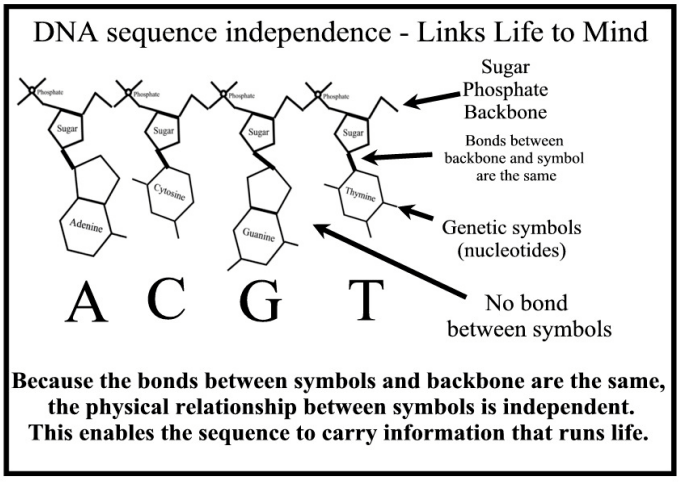
The patterns which lead us to a mind are the patterns we observe in DNA. DNA consists of long strands of four different genetic symbols. The genetic symbols are like the symbols Samuel Morse used to carry messages in linear sequences over telegraph lines. Morse used a binary code consisting of dots and dashes. He arbitrarily assigned combinations of dots and dashes to the 26 letters of the alphabet, punctuation marks and numbers. A sequence of three dots "means" the letter "S." Three dashes "means" the letter "O."

Like the morse code, the "messages" in DNA are organized per a genetic code of "Eerie Perfection" that uses four kinds of symbols instead of two. Optimization analyses of the genetic code describe it as the best of a million other codes randomly selected from the trillions of possibilities.[4] The four symbols consist of four molecules or nucleotide bases called adenine, cytosine, guanine and thymine. Instead of dots and dashes, the genetic code uses A's, C's, T's and G's. Like a liner Morse Code message, the messages in DNA are manifested by specific sequences of the four bases along a long linear sugar-phosphate backbone. Two copies of the same message are twined together in the DNA double helix. When it is time for the message to be read (expressed), the two strands are separated and another copy of one stand is made and sent to a translating processor called a ribosome. The ribosome reads the symbols in groups of three symbols called "codons." Each codon is translated by the ribosome into one of twenty amino acids (like the 26 letters of the English alphabet). The amino acids are then hooked together into long chains that are then folded into three dimensional shapes. The shapes become tools (called enzymes), construction materials or operating routines that are used by the cell to build, operate and maintain new cells.



Unlike the square drawing board, DNA is linear, not rectangular. However, the linear strands of DNA are far more extensive than the one hundred squares in the drawing board. It has been estimated that the messages needed to get life started are around 300,000 symbols long.[5] The DNA in each of the 100 trillion cells that comprise a human body is about 3 billion symbols long. If you were to blow up a cell 50,000,000 times its actual size it would be the size of a giant submarine over a mile long. The DNA that is tightly folded in the nucleus would be about 6,000 miles long.

So, how are the genetic symbols in DNA related, if at all? Actually they have the same kinds of relationships as the symbols in the drawing board image that display's the word "Think." Each of the "Think" discs are magnetically bound to the board but there is no chemical binding between the discs themselves. Similarly, the nucleotide bases are bound onto the sugar-phosphate backbone of DNA independently of other bases in the DNA sequence. For that reason they may be ordered in any sequence. Stated another way, the genetic symbols, like the letters in the word "Think," are not related by chemical or physical necessity. If they were, they would not have the capacity to carry the genetic information necessary for life.



Another relationship that is identical to the "Think" pattern in the vignette is that the sequence of symbols in DNA is specific for a future function. The meaning of a given DNA message is not hidden like the meaning of the hieroglyphics on the temples at Luxor. Their translation into functional parts, tools and instructions can actually be detected with modern technology. The sequences serve actual, not apparent, future purposes or functions. Like the meaning of the word "Think" the meanings of genetic words, phrases and sentences comprise real information that runs life. It is this functional or semantic characteristic of DNA and all cellular processes that implicates a mind as the cause of life - as the cause of the messages that run life.

Since the nucleotide bases of DNA are not related or ordered by chemistry, the only question that remains is whether chance may plausibly account for those lengthy sequences. Are the messages only "apparent" or illusory messages that are actually attributable to billions of years of random materialistic processes?

Even without a statistical analysis, the claim of illusion falls prey to the fact that the messages are actually copied, translated and put to use before our eyes. Statistical analyses simply put the last nail in the coffin of the claim of chance. Like the examples we have already looked at, the math is compelling because of the exponential decrease in probability.

There are at least 4 possible outcomes (A,C,T or G) at each base position that comprises a genetic message carried by DNA. Getting a specific sequence of 10 bases by chance is not less than 1 over 4x4x4x4x4x4x4x4x4x4 or one over a million ($1/4^{10} = 1/10^{6}$). Add another ten bases and the odds drop to about one over a trillion. All plausibility ends with any sequence of over 250 bases.

It takes three bases to specify one of twenty amino acid "letters" in the protein that will eventually be constructed from the translation of the message. These "letter" sequences of amino acids are folded into "words" called proteins. The words make up sentences, paragraphs, chapters and whole books of life. An average gene codes for 300 amino acids and therefore consists of about 900 bases. What is the probability of building a gene that codes for a 300 amino acid protein from scratch using our random generator?

$$PF_{\text{probability of function}} = \frac{T_{\text{number of trials for function}} = (1 \text{ trial of } 900 \text{ bases}) = 1 \text{ "word"}}{O_{\text{possible outcomes}}\ 4^{900}\ (4^{900} = 10^{542})} = 1/10^{542}$$

Suppose you have a system that can do one 900 step trial every second. Suppose one starts doing the trials right after the big bang, assuming it occurred a billion times 20 billion years ago, which is about 10^{25} seconds ago. There are about 32 million seconds in a year. So we can do 10^{25} trials, if we started work immediately after the big bang. But this still makes the protein unachievable through random means because 10^{25} divided by 10^{542} is $1/10^{517}$ (this exceeds the Universal Probability Bound 10^{150} that we discussed earlier).

Suppose we devote more resources to the task. Instead of having only one machine pulling and putting discs, we employ a number of machines equal to every elemental particle in the universe. That is 10^{80} machines. These resources reduce $1/10^{517}$ to $1/10^{437}$

We are now getting closer to probability, but the universal probability bound is not even in sight. What if we had the machines do the trials at the same speed that an elemental particle changes state? That is 10^{45} per second. We are still far short as $1/10^{437}$ minus $10^{45} = 1/10^{392}$.

Now we have a problem. We have reached the limit of probability resources in the entire universe. We are out of time and out of flippers. That is just for one tiny word in a book of information needed for the simplest form of life.[6]

To make matters worse, amino acids degrade very quickly. They are very unstable. So, while we are trying to get the first of 382 genes necessary for life, the environment is constantly switching off the machine. We don't have billions of years. Maybe we have only an hour. We are like robbers in the bank caught by the police before we have time to run even a few of the trials necessary to get the vault open.

The fact that renders the materialistic mechanism impotent is the exponential increase in the amount of probabilistic resources needed for the tasks chance claims to have performed. The exponential increase renders the resources available insufficient. Each additional step in the sequence increases at an accelerating rate the time needed to achieve any function, much less all of the function needed to comprise life. The train from LA to New York doesn't get out of the station before it runs out of time.

What about Natural Selection - doesn't that work?

Mind is the most rational explanation for the book-length messages needed to get life started. But suppose we set aside for the moment the question of the origin of life and ask another question. Assume life somehow got started without a mind, can matter alone explain the subsequent library of millions of different books and encyclopedias that contain the messages of the seemingly infinite variety of living forms that presently occupy the Earth?

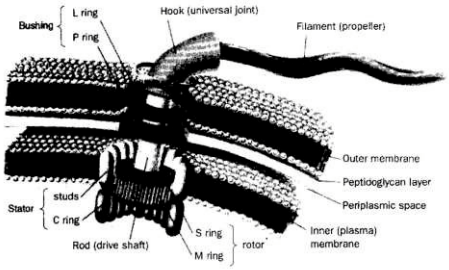
It is argued that once life arises, a combination of chance and environmental necessity or "natural selection" can sort replicating populations so that only the fit survive. Sometimes populations are split. Each split leads to a new chapter of a new book. Books spawn shelves of books, etc. Eventually the library arises and we are one of the books - a pretty big one.

The inherent problem with the idea is that "natural selection" is not the originator of the new function - new words that comprise the book. The origin of new function remains in the hands of random processes - random changes and additions to an existing book. The environment does not write, it sorts what has been written by chance. It acts as a saboteur until the new function actually arises. New function won't arise by chance if it is complex because complexity requires more time than is available to a random process.

For example, suppose the first form of life is a bacteria that cannot swim towards a food source. It lives only if it is served by an environmental waitress. It would be more fit for a cafeteria environment if it could swim to the food bar. To achieve that new "function" it needs a new series of genetic instructions that will assemble, operate and maintain a motor, systems to deliver energy to the motor, systems designed to sense food in the environment and systems that

will steer the moving organism to the food. Suppose one component of the motor consists of a new kind of bushing. The motor won't work without the bushing. A new gene is needed to specify the recipe for building a component of the bushing, another is needed to specify the time it is to be built, another is needed to specify how many are to be built, another is needed to take it to the right place in three dimensional space where it is to be used, and another is needed to cause it to be incorporated into the structure that may or may not ever arise.

Suppose the new gene for the recipe of the bushing requires a sequence of 900 nucleotide bases before its "function" as a part for a bushing arises. Until that function arises, natural selection does not act to save it. It more probably deletes the energy robbing proto gene before even a short part of it is ever formed. In fact, there is not enough time for a random process to produce a gene that requires a specific sequence of 900 nucleotides. But even if the miracle happens, the organism still can't swim to the food bar. Once the new gene arises, other components in the cell must also be present to transcribe and ferry the bushing to where it is needed at the right time. But, the motor requires more than just a bushing. It requires many more components.



THE BIOCHEMICAL COMPLEXITY OF A BACTERIAL FLAGELLUM

In the end, chance is just as much of a problem for increases in the diversity of life as it is for the origin of life itself. Natural selection may do a reasonable job of fine-tuning an existing population, but it is not the friend of innovation.

The primary defect of the unobserved hypothesized process of biological evolution is the absurd implausibility of the claim that a random mechanism can produce the sophisticated array of functional systems needed to run life. The exponential increase in the time necessary for each new step needed to attain the required function is the killer. Like a house of cards, the assembly of machines themselves requires an orchestrated timing. One cannot start building a sand castle today and expect to finish the job a year later after natural selection has torn it down.

A paper by biochemist Michael Behe and mathematician David Snoke illustrates the problem with the process even where new function is derived by randomly changing genetic letters in an existing duplicate gene rather than the development of an entirely new gene.[7] It is thought that much biological diversity arises from accidental duplication of genes, where the duplicate serves no apparent function in the genome. The speculation is that as the duplicate gene is randomly mutated new positive functions may arise that will make the organism more fit. However, new function often requires multiple changes, not just one. It may take as many as thirteen steps to get the new function. The Behe - Snoke paper shows that to get new function requiring only six changes, in a replicating population of bacteria one would need to have a population the size of 10^{21} (one trillion, trillion, trillion, trillion) replicating over 100 million generations.

New discoveries about DNA have caused scientists to question the adequacy of chance to explain biological function. A 2006 paper concludes that 80,000 "simple sequence repeats," or "SSR's" found in the human genome are not likely due to chance. SSR's are segments of DNA

not contained in genes that previously were thought to be non functional "junk." They are short sequences of bases that on average repeat more than 50 times in a series, such as "CTGCAG CTGCAG CTGCAG….." The author explains: "The probability that a particular sequence of n base pairs will appear at a specified site in a random DNA sequence is approximately (1/4)n [assuming equal proportions of each nucleotide]. Thus any repeated sequence longer than 20 or so base pairs is unlikely to appear solely by chance, even once, anywhere in the $3x10^9$ base pairs of the human genome.)" [8] If an SSR has an average length of 6 bases and each sequence has an average length of 50 repeats, then the average length of just one of the 80,000 SSR's is 300 bases. Thus the probability of a chance formation of one SSR is $1/4^{300}$ or roughly $1/10^{180}$ or practically zero.

The problem of chance also arises in the context of gene expression. New discoveries have shown that genes may be turned on or off and thereby made to combine selectively with a repertoire of other genes that have been turned on or off. A dictionary contains thousands of words. Similarly, the genome contains thousands of genes or genetic "words." Just as every word in the dictionary can be used or not used in a variety of combinations to express thoughts, the same is apparently true of genes in the genome. Stuart Kaufman, a scientist seeking to develop a new theory of evolution, believes that differences in morphology may be due to the sequence in which genes are used or not used. He notes that the possible combinations are enormous: "Well there's 25,000 genes, so each could be on or off. So there's 2x2x2x25,000 times. Well that's 2 to the 25,000th. Right? Which is something like 10 to the 7,000th. Okay? There's only 10 to the 80th particles in the whole universe. Are you stunned?" [9]

Accordingly, random events and random mutations are not good explanations for the messages needed for life. Since the messages are not related by chance or necessity, their clearly evident function and purpose inexorably leads one to the mind of an author.

Just as one cannot believe that the word "Think" appeared without the help of the sneaky mind of the intellectually gifted Maggie, one is forced to look to a mind to explain life. Indeed the activity of that mind is not really sneaky at all. Its products are easy for everyone to see. We really have no rational excuse for denying it.

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[1] Robert Deyes, MSc, (Medical Genetics, U. Glasgow), BS (Molecular Biology U. Portsmouth in England); research scientist, for Life Technologies and Promega Corporation. John Calvert, J.D., has a degree and professional experience in Geology and is managing director of Intelligent Design network, inc, a non-profit organization that seeks institutional objectivity in origins science.

[2] Jacques Monod, *Chance and Necessity*, pp 112-3 (Vintage Books 1971); Molecular Biologist known for his work on gene expression in the Lac Operon. Nobel Prize in Physiology

[3] William Dembski in *The Design Inference: Eliminating Chance Through Small Probabilities,*p. 36 et. seq. (Cambridge Press, 1998); and William Dembski, *No Free Lunch: Why Specified Complexity Cannot be Purchased without Intelligence* (Rowman & Littlefield (2002).

[4] S.J. Freeland and L.D. Hurst, *The Genetic Code is One in Million,* (*Journal of Molecular Evolution,* vol. 47, pp 238-248, 1998); In *Life's Solution: Inevitable Humans in a Lonely Universe,* p.13-21, (Cambridge Press, 2003) paleontologist Simon Conway Morris devotes a sub-chapter to the extraordinary efficiency of the Genetic Code. He captions it "EERIE PERFECTION."

[5] John Glass, et. al., *Essential genes of a minimal bacterium*, Synthetic Biology Group, J. Craig Venter Institute, (Proceedings of the National Academy of Science, Jan 2006, vol 103, No. 2, 425-430). The study concluded that the simplest form of life known to have existed requires around 382 "essential" genes. The average length of a gene of a prokayote is around 900 nucleotides, or 343,800 nucleotides for the 382 essential genes.

[6] ***Comparing the probability of the Amino Acid Sequence with the probability of the DNA sequence.*** Each codon or sequence of three nucleotides in DNA is translated into one amino acid. The acids are hooked together into a long chain that is then folded into a three dimensional shape. The shape of the protein determines its function. There are only 20 amino acids that are used and therefore the probability of any amino acid being in a particular position in the string arguably is 1/20. If the string is 300 amino acids long, the probability is $1/20^{300}$ or $1/10^{390.}$ This is a higher probability then the probability of the DNA sequence that specifies the amino acids in the string. That probability is ¼ ^{900} or 1/ 10 ^{542}. The reason for the difference is that a number of the 64 possible nucleotide codons specify for the same amino acid. This reduces the effect of errors in copying and translation. However, the difference in probability is actually insignificant because any complex sequence will exhaust all available probabilistic resources very quickly.

[7] Michael Behe & David Snoke, *Simulating evolution by gene duplication of protein features that require multiple amino acid residues* (*Protein Science*, The Protein Society September 2, 2004)

[8] David King, Edward Trifonov and Yechezkel Kashi, *Tuning Knobs in the Genome: Evolution of Simple Sequence Repeats by Indirect Selection* published in *The Implicit Genome*, Lynn Caporale, Editor, p 77 (Oxford University Press, 2006)

[9] Suzan Mazur, *The Altenberg 16: Will the Real Theory of Evolution Please Stand Up*? (Scoop Independent News, July 2008), the online edition is posted at http://www.scoop.co.nz/stories/HL0807/S00053.htm. A conference was held in Altenberg, Austria in July 2008, for the purpose of developing a new theory of evolution because the current one does not fit the data.