BOOK OF JAMES

1. Are there three worlds? The natural, the un-natural, and the super-natural?

2. The natural world began twelve and a half billion years ago and is called the universe; *universe* from Latin meaning *turned into one* and implying everything that exists. It includes the Earth and all things living or that have lived.

3. This natural world is a world described by *natural* or *physical* laws; the terms are interchangeable. Physical laws which apply over the universe if surrounding circumstances are the same. The law of gravity, as one example, describes a phenomenon of nature on the earth, the moon, the sun, and all the way out to galaxy macs0647-jd; 13.3 billion light-years in the distance, and beyond; assuming there is a *beyond*.

4. There are literally hundreds of physical laws, many being aspects of the same phenomena but classified for convenience. Some physical laws are classified as fundamental, implying that they are not derived from other laws.

5. Natural or physical laws are not laws as commonly known laws, to be obeyed or defied, but laws which describe or summarise natural phenomena. Physical laws never cause a particular phenomenon; they partly or wholly describe it. The law of gravity does not cause an apple to fall.

6. Physical laws are usually ultimately summarized and expressed in mathematical notation as equations; as one example only, Boyle's Law; $P1\,x\,V1\,=\,P2\,x\,V2$.

7. Boyle's Law does not explain *why* a model gas behaves as it does, nor does it *cause* a gas to behave as it does; it described its behavior. No natural law causes anything.

8. No law created so much as an atom of hydrogen; no law created so much as a speck of dust.

9. The un-natural world is governed by un-natural laws.

10. The un-natural world is the world with non-physical laws or rules that has been made and shaped by living things. These laws do govern. Commonly, there are penalties for non-compliance with the law.

11. An un-natural law or rule does govern and does not describe.

12. Un-natural laws govern voluntary or arbitrary choice-contingent behavior.

13. Natural laws have no element of choice.

14. One man living on an otherwise deserted island is bound by no laws except the laws of the natural world. His bones will become porous, his arteries will harden, his hair will grey.

15. Instantly, upon the arrival of another human on the island, un-natural or non-physical laws result from the arrival.

16. These laws of the living may be called customs, understandings, regulations, agreements, rules, and laws. They decide relationships between living things; between those governing and those governed.

17. Un-natural laws do not have the quality of rigidity and permanence of natural physical laws. Unlike physical, natural, laws they may differ if a geographical or age boundary separates individuals or if there are new governors of the state.

18. It is widely supposed that fundamental physical laws are constant over time. Paul Dirac offered the hypothesis that law of gravity changes as the universe ages. So far, research has not established his hypothesis. Max Planck questioned the right to assume that physical laws actually exist or if they have existed up to now, that they will continue to exist in a similar manner in the future.

19. There is no question of penalties for breaking natural laws.

20. Physical laws cannot be broken.

21. Wording of a physical law can be modified, qualified, classified, simplified, and restated to be nearer to a truer

description of a phenomena. The apparent breaking of a natural law describes a flaw in its original wording. What is called a natural law is a theory that has withstood rigorous testing and is considered validated by repeated observation of its predictions.

22. The written expression of a natural law theory may be unstable, exemplified by Newton's unhappiness with his primary explanatory construct, *attraction*, and the considerable disquiet of later scientists in the central notion of *force*.

23. The *constants* woven into the equations of laws are numbers, or sub-equations, introduced as part of a larger equations. They remain unchanged under specified conditions. Basically, constants are the ratios between one object and another. The ratio between a circle's diameter and circumference on a plane surface is a *constant*. It is arbitrarily denoted by the Greek letter, π, pronounced *pi*. No matter how large or small a circle is drawn, the ratio remains unvarying. The fine-structure constant is another example. Commonly denoted by the Greek letter, α, pronounced *alpha*, it is a ratio between elementary charged particles.

24. The *constants* of the standard model of physics relate mainly to the strength of the forces in the standard model of particle physics. They are a headache for naturalism as they are not predictable but needed to be directly measured. If everything in the natural world has a cause then the absence of an

explanation for these arbitrary numbers is abhorrent.

25. Natural, physical laws, are indifferent to un-natural laws. The Leaning Tower of Pisa will continue to lean whether or not the tower complied with the City of Pisa's Local Government Regulations.

26. So, we have two worlds, two worlds with physical/natural and un-natural laws co-existing. In some ways, a version of the prodigious genius Von Neuman's observation *we must always divide the world into two parts, the one being the observed system, the other the observer. One the natural observed world, the other the unnatural world of the observer*.

27. Mankind has known that there are two worlds since mankind began to think; and, since mankind began to think, mankind has wondered if there is a third world, a super-natural world.

28. Since mankind first began to think, mankind has divided into three parts; those who say yes, those who say they do not know, and those who say no.

29. Which is the truth?

30. *"What is truth?" said jesting Pilate, and would not stay for an answer.*

31. Well then, is there evidence of a super-natural world?

32. Many, including and especially many in scientific fields of endeavor, express outright contempt for acceptance of a super-natural world. If this contempt is reframed as a philosophy, it is describable as a mixed philosophy combining elements of materialism and empiricism. For those, it is axiomatic, requiring no proof, that strict philosophical naturalism is a mandatory presupposition in matters of knowledge.

33. *Materialism* has a one-substance view of the nature of reality; it argues that matter is the fundamental substance, hence material-ism. All things, including thoughts and consciousness, are the results of material interactions. Expressed differently, materialism is the belief that all that exists is ultimately physical and ultimately has a physical, natural, *cause* for its existence.

34. The popular scientific account of naturalism is that there are no gods, no purpose, no teleological goal-directed forces of any kind; that science has shown that happiness and unhappiness, memories and ambitions, identity and free will, are no more that the behaviors of nerve cells and associated molecules. That the relationship between nature and humankind is ultimately nothing but pitiless indifference.

35. *Physicalism* incorporates and extends materialism to permit it to contemplate and accept separate immaterial entities such as

time. The average person incorporates the philosophical concept of physicalism in his understanding of materialism.

36. *Empiricism* is not all that different in practice from materialism but is more commonly associated with the sciences and stresses pragmatism, experimentation, experience, observation and practicality.

37. By this encompassing definition then, materialism/empiricism, like rationalism, excludes any consideration of super-naturalism, and dismisses outright super-natural causes for the existence of any material or immaterial thing.

38. Everything we see, everything we touch, everything we hear, everything we think or feel emotionally, everything that exists is, by this materialist philosophy, governed by natural physical laws. At root, everything we see, everything we touch, everything we hear, think or feel had a natural *cause*. A natural cause, a physical cause, a material cause. There are no miracles. Materialism hold as a matter of unshakable faith that belief in miracles is a foolish belief in the super-natural, and that rigorous investigation will always eventually establish that any particular event or phenomenon had a natural cause; or the information regarding such was distorted in transmission and translation.

39. *Cause* can be looked upon as a judgment based on evidence established through a process of theory appraisal. The process

will yield levels of probability, and, below certain levels of probability, *improbable* is functionally equivalent to *impossible*.

40. C*ause* cannot be proven or established by a formulaic consideration of observations; this was particularly demonstrated by the smoking/cancer debate.

41. It is generally believed to be part of the settled order of life that men and women have an innate passion for comprehension, a desire to know. And it is widely accepted that every man woman believes what they think they know.

42. In the days before and shortly after the First Great War, men and women believed that the natural world was the sun and the moon, it was the sun and the moon and planets, it was the sun and the moon and planets and stars.

43. There was one earth moon, one Earth and only seven other planets, some with moons of their own.

44. Further away, at a great distance were the stars, and they were combined in one gigantic cluster of stars called the galaxy. The Milky Way. There was only one galaxy.

45. Inside, and beyond, the Milky Way, *clouds* could be seen.

46. Philosophers hypothesised an early multiverse theory that the *clouds* may be island *universes.* Astronomers and physicists commonly agreed that they were probably clouds of gas floating either in our galaxy or beyond it. *Clouds* became classified and this classification and naming affirmed their existence as clouds. The Andromeda galaxy was originally so named as a cloud. Today the *clouds* are more tightly defined

as interstellar and inter-galactic clouds of dust, hydrogen, helium and other ionised gases.

47. Thus, almost in living memory, and certainly at the time of The Great War, there was this one earth, one solar system, one galaxy, and groups of clouds. And these taken together was called the universe.

48. It was principally agreed that the universe was changeless, stable; it was correspondingly agreed, except among Jews, Christians and Muslims, that the universe had no beginning, and existed eternally. Hindu and Buddhists differed on this issue.

49. The infinite nature of this concept is philosophically appealing to some scientists because an infinite universe allows infinite possibilities. Things that are very improbable will happen if there is an infinite amount of time available. This is a personal article of faith. Other scientists are simply *comfortable* with a universe that had no beginning and see little need to query further.

50. *Infinity! Where things can happen that don't!*

51. In 1905, Albert Einstein had produced his theory of General Relativity. It was a coherent, erudite theory which described a universe that had always existed, much as Isaac Newton had

described it, steady, stable, changeless, infinite; a universe dominated by gravity.

52. When Einstein attempted to apply his General Theory of Relativity to the universe as a whole, he realized that space-time as whole must be warped. In itself, this would cause matter to move, shrinking uncontrollably under its own gravity.

53. As early as August 1914, at a time when other scientists were considering that actual observations did not describe a static universe, Einstein's coat was snagged in the prevailing paradigm of an infinite, unchanging unreconcilable with a finite, dynamic, universe. He now posited a peculiar counteracting force of cosmic repulsion.

54. Einstein's new ingredient was a work of imagination which he may have thought sounded scarcely more than pure fiction and he provided an explanatory proviso; *The term is necessary only for the purpose of making possible a quasi-static distribution of matter, as required by the fact of the small velocities of the stars.* He named it the Cosmological Constant and termed it κ, the Greek letter *Kappa*. Einstein's κ is directly proportional to Newton's empirical gravitational constant, *G.*

55. Einstein introduced this cosmological constant into his General Theory of Relativity to *hold back gravity* and achieve a static

universe. It is a plausible explanation of the constant is that, once Einstein had his two fundamental principles, relativity and an invariable speed of light, he could reasonably deduce the existence of a *constant* a priori. From that point it was a matter of estimating the ratio.

56. This was grudgingly acceptable to cosmologists and physicists who assumed with him, as a matter of faith, axiomatically, that the universe was stable. But adding additional or arbitrary terms to a theory is not something that scientists find appealing and others argued against it considering it to a stop-gap solution fated to be replaced. Moreover, others were impressed with relativity as it stood and had spent time verifying the original theory to their personal satisfaction.

57. In the US, Vesto Slipher had reported observations that implied an expanding universe in 1914. In 1922, Alexander Friedmann derived his *Friedmann Equations'* from Einstein's field equations; among three derived conclusions one showed that the Universe might expand at a rate calculable by the equations. Georges Lemaître independently found a similar solution in 1927. Einstein resisted the conclusions of expanding spacetime though he accepted the mathematics.

58. The scientific world divided into camps: -
The universe was static and infinite
The universe was dynamic and finite.

The question now was; did any observable or testable evidence exist which could point to which theory was correct?

59. In the 1920's, the astronomer Edwin Hubble, working with teamster/electrician turned astronomer, Milton Humanson, stunned many by declaring that there was more to the universe than the Milky Way.

60. He said in effect, *those clouds, those nebulae, are not mist, nor clouds of gas, but galaxies of stars like our Milky Way.*
Why, the people said, *there must be a hundred of them.*
Thousands, said Hubble, *of galaxies.*
Maybe millions.

61. Astonishing as it was, this news did not affect the common philosophical proposition that the universe was unchanging. That view was still widely if not invariably held; all the discovery meant was that the universe was bigger than had been imagined. It was still eternal.

62. Hubble was not done. In 1929, he announced a further dramatic discovery which sat astronomy down to think again. He noticed, as others before him had reported, that the light coming from these galaxies was shifted towards the red end of the light spectrum. This led to a conclusion that the galaxies and clusters of galaxies were in fact flying apart from each other at great speed, and that the universe was therefore definitely, provably, growing in size.

63. In effect, Hubble had spoken once more and had said, *I can say that the universe is getting bigger all the time, even as we speak, and the galaxies further out are moving away faster than those closer in. And not moving away slowly but at tremendous velocity.*

64. An astounding discovery such as this was not to be accepted without enquiring whether others could see what Hubble saw. Others did; in fact, others had. No matter how it was interpreted, it meant that the universe was most definitely not static.

65. This became the question; It is not natural, to reason that, if the universe is getting bigger then at one time it must have been smaller? This was, and is, considered to be logically coherent.

66. By the same logic, the proposition was aired that if the universe was smaller yesterday than it is today, then it must have been smaller the day before that, and so on.

67. And by the same logic the universe must have had a beginning.

68. Logic, mathematics, and physics further reasoned and indicated that at one particular yesterday, over thirteen and a half billion years ago, all the matter of the universe condensed into an infinitely small, infinitely dense and very hot region of

space. Into, putting it differently, a dimensionless point in infinitely small space.

69. This dimensionless point is known as the initial singularity, something containing all the mass and space-time of the observable and unobservable universe.

70. When this singularity was reached, it was a point, a point in the history of the universe, when there was no yesterday.

71. This hypothesis inescapably indicated, or at minimum implied evidence of, a super-natural creation of the universe.

72. It was equally inevitable that many, not only scientists, found this new statement of an ancient premise unappealing.

73. One scientist spoke for many when he said the idea of a super-natural creation of the universe was *repugnant*; another, that it was *philosophically unacceptable*. A search began for a flaw in the logic and a natural explanation was explored of a beginning of the universe without conceding a super-natural cause.

74. One reason for this repugnancy is that, if Einstein's equations suggest a super-natural beginning of the universe, then this is a serious argument against the philosophy of materialism as materialism holds that the universe, everything which exists, is ultimately physical and has a natural cause.

75. Since everything has a natural cause then what was the natural cause for the singularity?

76. An eternal universe was acceptable. There was no explanation for an eternal universe nor an explanation even needed. The universe always was and always will be. It was an issue without any need or possibility of discussion much less investigation. But a point of time when the universe appeared or was born called for discussion.

77. What is the word when something appears out of nothing, mankind asked. *Materialise* suggests itself as the word and, indeed, one connotation of materialise is the bodily manifestation of a pure spirit, a ghost, something beyond natural laws or explanations. This was now an issue needing discussion, and resistance if materialism was to prevail; it needed combatting if super-naturalism was to be convincingly rejected.

78. The concept of a *Big Bang* beginning of the universe itself was in some measure accepted, and evidence began to gather.

79. The *Big Bang* theory predicted testable observations could be made to validate the theory. Even though some elements within the theory might change, the foundation of the theory should stay the same, durable, constant, reliable.

80. Scientific canon holds that if any theory makes a prediction, and enough observations confirm the prediction, then the theory reaches a level of acceptability barely short of absolute certainty.

81. A universe with a beginning is extremely disturbing culturally, philosophically, and scientifically. Desirable, comfortable axioms die hard even in the face of contradiction by observation.

82. It took an overwhelming volume of evidence supporting the Big Bang theory before it was finally accepted as a viable theory by the majority of the scientific community.

83. There were 5 major indications that led to general acceptance:

    i. The Hubble diagram, demonstrating that the farther an object, the faster it recedes from our position,
    ii. The predicted cosmic microwave background radiation; fundamentally revealing that in every direction of the sky, photons may be found of almost the same temperature, 2.7 Kelvin, coming from no apparent source,

iii. The Sunyaev-Zeldovich effect, which rules out a local origin of that microwave background,

iv. The abundance of the light elements, especially hydrogen, helium, and lithium, which is predicted by nucleogenesis, the process creating new atomic nuclei from pre-existing particles, during the Big Bang.

v. The fact that the theory is a natural solution to the widely accepted and demonstrated Einstein equations of general relativity.

84. The apparent termination of a paradigm; the profound change in scientific opinion to a universe with a beginning, represents the most weighty and compelling adjustment naturalism can make towards a possibility of super-naturalism. A beginning may not concede the existence of a Beginner but it does strongly argue a requirement that naturalist dogma denying the super-natural should be re-examined.

85. The first determined opposition to a beginning of the universe was the steady-state, eternal universe model; posited as a rational scientific alternative by Fred Hoyle, Hermann Bondi and Thomas Gold.

86. Hoyle had no argument with the observations that the universe was expanding but disagreed on interpretation. He, and others, argued that the universe could be eternal, and unchanging while still being an expanding universe. As the galaxies move away from each other, so the steady-state theory proposed, new galaxies develop to fill the space the others leave, that is, new matter is continually created, apparently out of nothing.

87. Hoyle pointed out that this continuous creation of new matter was no more inexplicable than the creation at one stroke of all the matter of the entire universe from nothing.

88. Within 20 years Hoyle's steady-state model was discarded, but one question resounded; what is the difference between Hoyle's new matter *slowly created from nothing* and all the matter of the entire universe created in one super-hot flash, out of nothing?

89. *Metaphysics* is a word based on the Greek *ta meta ta phusika, the things after the Physics*, referring to the written material which followed after the Physics section in an Aristotelian work. *Metaphysics* acquired a definition of the study of things transcending what is physical or natural.

90. The pursuit for an explanation of the origin of the universe has led a number of materialism-only scientists into the world of metaphysics and argument put forward that it is possible to have something naturally emerge from nothing. Closer examination of the theory reveals that it depends on an accommodating definition of *nothing*. The concept of *nothing* was dismissed by Aristotle when he wrote that *nothing is what rocks dream about.*

91. Other scientists argue while the universe might appear to be created from nothing, the laws of physics actually did allow for the creation of the universe out of nothing; according to the probabilistic dictates of quantum field theory, even an apparently perfect vacuum seethes with particles and antiparticles nipping into and out of existence.

92. This proposition is based on an aspect of physics which allows the possibility of a small but not zero possibility of something arising from *nothing* because of what is described as a quantum fluctuation in that *nothing*.

93. The incredulous response to this was that when something, anything, the size of thimble, emerged from nothing as a result of a quantum fluctuation, or even a credible report of such, the theory stood an infinitely small but non-zero chance of acceptance. The responses doubted that a space pulsating with gravitational waves and bubbling with particles really qualified

as empty. Once again, a definition of *nothing* is important and the point is made that *nothing* may not conform to intuition.

94. It is fair to say that this theory has a lineage going back to ancient Greece. Chaos, Greek *Khaos*, was the origin of everything and the very first thing that ever existed, if an empty chasm can exist. It was a black primordial void, which everything was created from including the universe. In the beginning, *Khaos* was a state of random disorder existing in primordial emptiness.

95. Enthusiastic journalism whereby restatements of entities like the quantum field theory, dark matter, or aspects of the standard model of particle physics, led to absurd hyperbolicity and pronouncements of a universe from nothing. Such journalism additionally speaks of media and scientific judgment influenced by an individual contempt for concepts of super-naturalism, religion generally, and specifically the concept of a Deity.

96. A different theory of the origin of the universe is that the universe may not be eternal but laws of physics are eternal, or rather that timeless natural physical laws exist. This assumes purposeless laws existing in either infinite time or in no-time for a universe which does not exist.

97. There is insufficient or no explanation in what manner these entities could have pre-existed the sudden emergence of the

universe, why they should have existed at all, or why they should have had the form they did. Nor is there any experimental or observational process of the mechanics of how the universe-generating laws function.

98. Another theory, dismissive of a suddenly emerging universe from nothing is an oscillating universe. In this model, the universe would have a beginning in some kind of initial singularity expand for a while into the universe we know, then contract for a while, like a lung. This expanding and contracting could go on eternally. So, a finite beginning, but an infinite future.

99. One rationale for accepting the theory of an oscillating universe is a strong reluctance and determined refusal to accept the alternative possibility of a universe emerging from nothing. If a universe can emerge from nothing then anything can.

100. This theory placed its proponents, possibly unknowingly but nevertheless solidly, in consensus with Hinduism and Buddhism. Followers of those religions have long held to this hypothesis as they believe that there was no single creation but rather that the universe, without any need for the hypothesis of a creator deity, is created and destroyed by fire, wind and water in a series of perpetual cycles. The details differ but the result in the same, Big Bang followed by Big Crunch followed

by Big Bang.

101. A universe running through perpetual endless cycles of creation and destruction is an elegant, aesthetically pleasing solution to the origin of the universe. The universe or something like it is eternal, just as Christians and Jews never believed.

102. However, observational evidence agrees with the suggestion that the universe seems never to be able to collapse again, if it ever once did, and the oscillating universe if there is one has come to the end of its oscillations and is dying a slow *heat death*.

103. The *heat death* of the universe is a hypothesis that the universe will diminish to a state of no thermodynamic free energy and therefore can no longer sustain processes, such as life itself, that increase entropy; when the universe reaches thermodynamic equilibrium. Current data involving concepts of topology of the universe, dark energy, and continual expansion strongly support the hypothesis.

104. If the heat death hypothesis is correct then hypotheses of an eternal universe, or a bouncing universe, are not. Leaving only one sudden appearance of a single universe from nothing or a universe of universes originally appearing from nothing, the multiverse theory.

105. Quantum mechanics may be seen as denying materialist philosophy that whatever exists must have a cause. In quantum mechanics no cause is needed for the universe to suddenly emerge; a different evolution is possible, in which the universe does not have to go through time zero, but instead goes into *complex time*, around a singularity at time zero. The complex numbers basically give a second dimension to time that the universe can explore.

106. Insofar as coherence is possible, quantum mechanics implies that the universe is eternal but cyclical.

107. These multiple theories are either dead, moribund or are severely wounded by observations which contradict them. Theories of origin are now advanced which are incapable of validation or contradiction through observation, and, in place of theories so incapable, a cascade of 'what if's' and possibilities take the abandoned place.

108. A more philosophic/metaphysical argument on the origin of the universe is that common spoken and written language is incapable of accurately translating the language of mathematics. A universe with an explicable natural beginning is provable in such a language, so the theory goes. Observations or confirmation by common standards cannot be made.

A proposition that the origin of the universe may be discovered

hidden in undecipherable Olmec characters is an unfair analogy.

109. The worship of mathematics as the primary manifestation of, or another word for, God, has a long history. Pythagoras said, *Bless us divine number who made gods and men;* Plato said, *God geometrizes continually*, Galileo, *Mathematics is the language in which God has written the universe,* Kepler said, after studying his mathematics, *I think the thoughts of God after him*, Jean-Henri Fabre said, *Universal geometry tells of a universal Geometrician*; Heinrich Hertz, *One cannot escape the feeling that these mathematical equations have an independent existence and intelligence of their own.* Mystical mathematicians, then, trust in a super-natural world.

110. One particular model may account for dark matter and dark energy and the origin of the universe, resolving multiple problems simultaneously. In physical terms, the model describes the universe as being filled with a *quantum fluid*. The scientists propose that this fluid might be composed of gravitons—hypothetical massless particles that mediate the force of gravity. If they exist, gravitons are thought to play a key role in a theory of quantum gravity.

111. This model is not dissimilar to that in 5 BC. Anaxagoras believed that the original state of the cosmos was a primordial mixture of all its ingredients which existed in infinitesimally small fragments of themselves. At some point in time, this

mixture was set in motion by the action of *nous,* or mind, and the whirling motion shifted and separated out the ingredients. The school of Atomism soon followed basically by describing the fragments as indivisible indestructible *atoms.*

112. A response to the theory that the universe was filled with hypothetical massless particles before the Big Bang is put that *hypothetical massless particles* will do for a working definition of *nothing*.

113. The *multiverse* is not a theory but a prediction of other theories; predicted by string theory which postulates that there is more than one universe; many universes can exist in a foam of such. It is futile to speculate on such universes since string theory does not attempt to describe the conditions, or natural laws controlling those universes but states that anything that can be imagined can happen or actually has happened in such a multiverse. Furthermore, nothing can be observed, because due to the properties of spacetime each universe is causally disconnected from others – including this universe.

114. String theory advocates offer a new paradigm for validity of any theory; *non-empirical theory confirmation.* Physicists have developed theories of immense mathematical sophistication which are beyond the reach of empirical falsification, even in principle. From a naturalist viewpoint it is not unfair to say that the multiverse theory is a means of fending off the impasses that fully naturalist theoretical

physics is in. It doesn't need to be tested empirically. A multiverse means that the universe we know may have come into existence suddenly, but it didn't come out of nothing; it is one of 10^{500} possible universes existing in an ocean of eternal massless particles. Being so far out of contemplation there is no longer any necessity to query the sudden beginning of the universe.

115. A bizarre paradox emerges that if indeed all things are possible in a multiverse then it is possible that a deity can emerge with the power to create a universe of its own and create life in one corner of that personally created universe; our current universe.

116. Still another solution to the creation problem, as it is increasingly described, is to theorise that there was something, in other words not *nothing*, before the Big Bang but it was not a universe either – it was a cosmological *phase* - a term that evokes the ghost of the cosmological constant. In this cosmological representation the universe did not begin with the Big Bang.

117. In this *phase* there is a repetition of the theory that natural, physical, laws like gravity, especially gravity, existed for a universe that would exist later. There is no time in this phase. There is however an undefined something in which other laws hung.

118. Scientific theories since Sir Francis Bacon have been kept on a tether of observation and experiment. String theories with their emergent multiverse theories have escaped that tether and bolted. Observation of a part of a hypothesis is now enough on its own to validate; predictions are unnecessary.

119. Accurate predictions formerly were the vindication of theory; this is being supplanted by a concept of regarding the beauty and elegance of the mathematics behind the theory. Some theorists proclaim we need pure unbridled speculation, driven by imagination and vision. The sour response to this enthusiastic endorsement of a million hypotheses is that it sounds great, except that physics has not exactly suffered from a dearth of speculation. Instead, it has suffered from a lack of sound logic.

120. O*bservation*, like *nothing*, is more widely defined. The *observation* need not be an observation actually detected in a result of the application of the theory, simply that one of the conditions of the theory be observed. As an instance, because the inflation of the universe has been observed and inflation is part of string theory, then multiple or parallel universes are valid scientific theories because the elegant mathematics prove it so. Mathematical relations achieve a quantum of certainty and acceptance.

121. Particulars the theory discloses are that some multiverses are connected, some are separate, some enter and exit at different

times. Some exist in a state of superposition, like Schrodinger's cat, both alive and dead at the same time.

122. Another way of accounting for the origin of the universe is to regard the creation of time at its origin as irrelevant and the real question is the *arrow of time.*

123. The arrow of time was invented as a term in 1927 by Eddington, the cosmologist who confirmed Einstein. There are several arrows of time but at the root they refer to the fact that events are irreversible, time only runs in one direction, and disorder always increases. *You cannot step in the same river twice* and *you cannot unscramble an egg* and *a broken cup never reassembles itself* are expressions exemplifying the arrow of time.

124. The arrow of time conundrum or *what happened before the big bang?* is overcome if a hypothesis is accepted that cosmic time has no direction. In short, in this hypothesis, time did not commence with the Big Bang. Paradoxically, this is the Christian Jewish belief as well; God dwells timelessly.

125. In this scenario pocket universes are always sprouting from an uninflated high entropy background that has no beginning or end. All that is required is empty space, a shard of dark energy and wait; assuming that *wait* has any meaning in a directionless time.

126. This explains why our universe began in a state of low entropy; essentially, there is a symmetrical background of high entropy, but locally our universe will go towards high entropy equilibrium with the rest of the background.

127. So that explains it. The universe is not eternal but the background, out of which it came, is eternal. And it has been shown in elegant mathematical equations.

128. It is fair to say that these theories are not widely accepted in the scientific community principally because corroborative validation of the Big Bang theory continues to be discovered. The latest important piece of evidence was the discovery of the Higgs boson which behaved precisely as the Standard Model predicted. Validated predictions are still the gold standard of physics.

129. At this point, science has reached a halfway house. Without an acceptable alternative to a universe suddenly emerging from nothing, a number of scientists are all or part-way to being comfortable with the premise that the universe is eternal, irrespective of heat death predictions and that no explanation for the existence of the universe can ever be found. This is a re-make of Gödel's Theorem that there are certain things we know to be true but cannot prove them.

130. Another alternative to the unfettered belief in an eternal universe is that there is some so-far inexplicable but eternal

force, like vacuum energy or even evolution, that drives *nothing* into existence as a universe; that there is perpetual eternal energy which manifests itself as matter. It trembles on the lips an admission that this force is a super-natural force and perhaps some sort of God but not the common person's God; a God for scientists, particularly physicists, cosmologists and mathematicians, and, since Darwin's Origin of Species, biologists; a God acceptable to naturalism.

131. The properties of this force, or law, are undiscovered and probably unknowable except one of *aseity*; by which something exists in and of itself, from itself and contains within itself the cause of itself.

132. Still another explanation is that the universe did not have a creation. What we experience is a *hologram* universe. Everything seen, touched and heard in three dimensions emanates from a flat two-dimensional field. The idea is similar to that of ordinary holograms where a three-dimensional image is encoded in a two-dimensional surface such as in the hologram on a credit card. However, this time, the entire universe is encoded. Time emanates from this perception. It is all explained in the mathematics.

133. The God of swine has a snout and bristles, the God of science is in its definition phase.

134. Professor Mir Faisal, whose team developed the cosmological phase theory remarked, *in any case, I do not believe in a God of gaps, with Big Bang being a big gap, but in a God who made the mathematics describing reality so perfect that there are no gaps, not now, and not at Big Bang*.

135. Professor Faisal is not alone in believing in a God who is a mathematician. who makes laws that can create matter from nothing.

136. Professor Einstein had much the same theory as Faisal with a clearer pedigree and perhaps more definition.

137. Einstein stated quite clearly, earlier than Mir Faisal, that he did not believe in a personal God; *It was, of course, a lie what you read about my religious convictions, a lie which is being systematically repeated. I do not believe in a personal God and I have never denied this but have expressed it clearly.*

138. He expanded on this when he cabled a reply to the question, do you believe in God? *I believe in Spinoza's God who reveals himself in the orderly harmony of what exists, not in a God who concerns himself with fates and actions of human beings*.

139. Spinoza was a 17th century Jewish philosopher, expelled for heresy, who did not believe in the concept of personal God; he believed in a real God but an impersonal one; he makes that clear at the conclusion of Book 1 of his *Ethics* when describing

an absolutely undeniable infinite being. Spinoza's brand of Judaism had more to do with the early Sadducees who also did not believe in a personal God.

140. In the first book, Spinoza postulates that nature is an indivisible whole, without a cause, substantial. Outside of nature, there is nothing, and all that exists is a part of nature. This unique nature, unified and necessary is what Spinoza calls God. Because of the inherent necessity of nature, there is no teleology in the universe: nothing has to end. All the talk about God's plans, intentions or goals are just anthropomorphist fictions; attribution of human motivation, characteristics, or behavior natural phenomena. To judge by pronouncements of modern scientists this explanation of Spinoza is acceptable except that the word *God* would be deleted and the word *nature*, capitalized, would be substituted.

141. Spinoza called nature, God. Scientists call God, Nature.

142. Darwin, too, held there are laws designed by a designer who took no interest in their manifestation; an indifferent, but omnipotent God. He wrote to his publisher,
I cannot persuade myself that a beneficent & omnipotent God would have designedly created the Ichneumonid with the express intention of their feeding within the living bodies of caterpillars, or that a cat should play with mice.
In an on-the-other-hand remark he wrote;
I cannot anyhow be contented to view this wonderful universe

& especially the nature of man, & to conclude that everything is the result of brute force. I am inclined to look at everything as resulting from designed laws, with the details, whether good or bad, left to the working out of what we may call chance.

143. Spinoza's God is the half-acceptable solution for those who cannot accept a super-natural creation of the universe from a genuine commonly understood nothing but can neither accept that the universe is eternal.

144. Replace the opening lines of Genesis, In *the beginning was the Word* with the line, In *the beginning was the Law* and there is an explanation of the Universe with no necessity for further discussion as, by its nature, the account is conveniently impenetrable.

145. Contradicted by evidence that a universe appeared from nothing; naturalism, however expressed, perforce accepts evidence-free theories of an eternally existent universe; perpetually recreating multiple universes; a universe created by evidence-free eternal, irrational, disembodied Forces or Laws; a definition of *nothing* differing from that commonly held, or, failing all these, an axiomatic statement that a rational natural explanation will become known given enough time.

146. The impossibility, or incomprehensible improbability of anything, from a grain of sand to the entire universe, materialising from *nothing* cannot be admitted without a

simultaneous admission that the origin of the universe itself is evidence of a super-natural world.

147. In *The Name of the Rose,* an abbey hosted a debate on the issue: *Did* Jesus *and his disciples own anything, either individually or in common?* a question with little chance of resolution. It becomes clear that they are, in actual fact, discussing the church's approach to poverty, property, and the Pope's authority to increase his wealth. This type of caginess is encountered when discussing the origin of the universe and explains efforts to redefine *nothing* as *everything;* eternal, possibly incorporeal.

148. The real issue is whether materialism will be forced to incorporate elements of super-naturalism in a new synthesis of naturalism or perish as a philosophy.

149. Perishing is unlikely; it is more likely that naturalism will acknowledge that events may appear supernatural but promise and predict that, if patient, a natural cause will be discovered.

150. A cell wall is not a soap bubble.

151. Each soap molecule has one end that is attracted to water and one end that is repelled by water.

152. This dual-ended, polar, nature of soap molecules forces the molecules to arrange into structures such that all the *water-loving* ends of the molecule face the water while the *water-hating* ends face the air.

153. When soap and water are mixed together and air is introduced into the mixture, soap forms a thin skin or wall and traps air, creating a bubble. The structure is temporary; principally because the air pressure inside is greater than the pressure outside and, with evaporation, pressure ruptures the bubble's thinning envelope.

154. The pressure inside the soap bubble does not diminish because the bubble structure does not permit, except negligibly, movement of mass through it – whatever is in the bubble at time of formation is trapped in it.

155. The frail evanescent soap bubble is foolishly and repeatedly suggested as comparable to a cell wall.

156. The comparison is simplistic, far-fetched, bizarre and preposterous. The Colorado ADX supermax federal prison, the Alcatraz of the Rockies, with its movement detectors, electric

fencing, concrete walls, steel bars, unpickable locks, signaling structures, communication networks and night-vision cameras is a far better comparison to a living cell wall, though very seriously inadequate.

157. The image of a soap bubble has resonated cognitively and visually with school teachers, journalists and the wider public; but comparison of a cell wall with a soap bubble is not simply wrong; it is seriously misleading in that it contributes to a paradigm that a cell wall is a reproducible, almost commonplace, manifestation of matter, given certain conditions.

158. It was necessary to halt the progress of this commonly recited myth, that cell walls occur as naturally as soap bubbles do, before progressing to the question whether the origin of life, like the origin of the universe, is an event which may constitute some evidence of the existence of the super-natural.

159. Reason indicates that inquiry for the origin of life should commence with examining data of what is incontestably known about first living things.

160. What is known is that the first living thing had life.

161. Life is definable by its outstanding characteristic that it avoids decay into equilibrium. Put another way, the components of a

living cell resist entropy. A cell which settles into balance is dead, to paraphrase Schrodinger's definition of life.

162. What is known about a living thing is that it is made of cells.

163. What is known of a living cell is that it must sequester or protect itself from its environment. Ultimately, poetically speaking, the cell's environment wants the cell dead; like the rest of the natural universe.

164. What is known of a living cell is that it manufactures its components from matter found in in its environment.

165. What is known of a living cell is that it reproduces, grows, and repairs or replaces its components.

166. What is known is that a cell fundamentally comprises energy-driven collaborating machines which drive the second-by-second activities of the cell. There is no living cell that does not have working machinery.

167. What is known of a living cell is that it sources its energy from its immediate environment.

168. What is known is that, absent these knowns, there is no living cell.

169. What is known is that never has living cell been created in a laboratory.

170. What is known is that the earliest living thing was in existence approximately four billion years ago.

171. What is known is that fossils of bacteria have been isolated and identified.

172. What is known is that, almost without exception, fossils of bacteria isolated from remote and ancient material closely resemble modern bacteria at both morphological and molecular levels; the cyanobacteria have left a fossil record that extends into the Precambrian era, 3.5 billion years ago. Fossils left by *magnetobacteria* have been found in rocks as old as two billion years.

173. What is known is that no fossil of an entity identifiable as a precursor, or *protobiont*, of a living cell is identified or acknowledged.

174. It is universally agreed that it was indispensable for earliest life to possess a self-replicating system if it was to endure.

175. It is universally agreed that the first self-replicating system was required to be complicated enough to metabolise; that is, inaugurate and maintain the chemical processes required to maintain life, namely, movement, growth, excretion,

reproduction and exhibition of sensitivity to environment. It needed a cell wall strong enough to maintain integrity, to protect, and to facilitate *respiration*; the process in living organisms involving energy production.

176. Proposed precursors or *protobionts* to the earliest living cell are inchoate theoretical entities imagined to exist simply because materialism demands such a supposition. Absent this presumption of a precursor, naturalism holds the origin of life is inexplicable; an intractable mystery comparable to the origin of the universe.

177. The modern synthesis of the theory of evolution presumes to commence with a functioning living cell and consequently the theory of evolution has no role in life's origin, any more than in the origin of the universe. As the monistic or singleness of a single universal tree of life appears increasingly obsolete and the belief that earliest life forms are related by such a tree is stronger than the data to support it, evolution excludes from consideration supposed or possible *protobionts*.

178. The characteristics of *protobionts* – theoretical clumps of organic molecules surrounded by something similar to a cell wall which pursuant to chemical or physical laws, resemble earliest life - are then left to those theorists with qualifications in laws of chemistry and physics.

179. Bacteria and archaea are known as *prokaryotes*.

180. *Prokaryote* is a neologism formed by the conjunction of two Greek words, *pro* meaning *before*, and *karyon* meaning *kernel*. The word implies that prokaryotes existed before organisms with multiple cells with well-defined nuclei or *kernels*. *Prokaryotes* are the earliest known examples of life.

181. The existence of prokaryotes, though not the name, was speculated in the 1640's, confirmed in the 1670's, and established as a cause of infection in the 1870's.

182. Dogma up to and including the 19th century held that prokaryotes were simple and undefined single cells devoid of an organised subcellular architecture. The *eukaryotes* which came along a billion years after, so the dogma ran, were the first to fabricate proteins and the first to possess DNA. The dogma, held by Darwin and contemporaries, was overthrown but survived as a common misunderstanding.

183. Prokaryotes then were, and still are, consistently described in negative terms; commonly by describing them as *simple* and *lacking* some feature of multicellular eukaryotes like sexual reproduction, a membrane-bound nucleus, a cytoskeleton, an intricate system of internal membranes, and mitochondria to perform respiration. This created a seriously unhelpful impediment to appreciating the immensity of prokaryotic

complexity.

184. The negativity was the necessary concomitant to the development of the microscope. To study bacteria, a lens with a magnification of a minimum of 400x is essential. Additionally, such a lens needs to overcome chromatic and spherical aberrations and collect a cone of light that is as wide as possible. This last quality did not come until the 1870's by which time the paradigm of evolution had a strong footing. In 1880, the noted physicist Tyndall declared,
Believing, as I do, in the continuity of nature, I cannot stop abruptly where our microscopes cease to be of use. Here the vision of the mind authoritatively supplements the vision of the eye. By a necessity engendered and justified by science I cross the boundary of the experimental evidence.
Not much has changed since this remark. Where observation fails, imagination, deformed by paradigm paralysis, supplies the details
authoritatively and *justified* by *necessity*.
As the resolution of 0.2 microns is a physical limit imposed by the wavelength of light and as bacteria range from 1 to 10 microns, many precisely known features of bacteria had to wait until the arrival of the electron microscope in the 1930's. It is a reasonable speculation that had Darwin been in possession of an electron microscope he might have hesitated before writing what he did in the Origin of Species.

185. Any living cell, and that includes the earliest known prokaryote cells, are the most complex known systems in the universe. There is nothing simple or elementary about a cell. The amount of information required to fully document a cell at one time is so large it has not been fully modelled. The notoriously complicated tax system of Brazil is as simple as a recipe for making toast compared with the intricacies of a prokaryote cell.

186. It is a mistake, fostered by necessity of static diagrams of motionless cell components, that a cell is static. A cell can be described as an organised seethe where, ceaselessly, specialised machines fabricate parts for other machines, recycling centers shred deformed parts for reconstitution, machines like electricity generators drive other machines, machines transport, and copy, and probe the environment. Considerable methodical, systematic and orderly chemical reactions are constantly causing and adding to the churning activity.

187. The question of the oldest form of known life settles between the prokaryotes, bacteria or archaea, but since archaea are less studied, bacteria will do for now. To do otherwise, and include archaea, would entail a distressing number of repetitive recitals of lack of available detail.

188. Contenders for the very first bacteria are the actinobacteria, the firmicute bacteria and the cyanobacteria.

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189. The cell wall surrounding a bacterium is as intricate and complicated as the rest of the cell.

190. The expression, *cell wall* is used as a convenient and readily understandable précis. It is more descriptive to refer to the outer covering of the cell of bacteria as the cell envelope or the extracellular matrix. The word *wall* will continue to be used.

191. The cell wall of the earliest known living things, the bacteria, exists in two basic parts – a cell wall and a plasma membrane.

192. The free living bacterial cell wall provides structural integrity to the cell; its primary function is to hold the cell together while protecting the molecules inside.

193. The cell wall is a separate, elaborate and sophisticated structure encompassing a system of gates and passages which control ceaseless traffic in and out of the cell. There is a dense population of specialized conduit proteins, terminating in pores on the exterior of the cell.

194. In appearance, the cell wall may be gummy or slimy, covering a lattice-like rigid framework of *peptidoglycan*, a polymer mesh made of sugars and amino acids.

195. There is pressure inside a cell known as turgor pressure; more readily understood as, and responsible for, the osmosis learnt in biology classes in school.

196. The turgor pressure inside the bacterial cell is a consequence of a more concentrated mixture inside the cell than in its surrounds; if unrestrained by the cell wall, the mixture would diffuse into its outside environment desiccating and destroying the cell.

197. The cell wall, it could be said, prevents the cell from exploding.

198. Soap bubbles!!!

199. There are four features external to the cell wall commonly found in this example of the very earliest living things.

200. On the cell's surface there are hairy looking appendages termed *fimbriae* and *pili*; the names mean long-haired and short-haired and may be interchanged. The long-haired are the *fimbriae* from the Latin for *fringe*. The short haired are *pili* from the Latin pilus, *hair*. There may be one, ten, dozens or hundreds depending on the bacterium.

201. They are hairy looking but they are not hairs; any more than a cell wall is like a soap bubble.

202. Pili and fimbriae are versatile, multi-functional, sophisticated, multi-unit, *machines* made of protein with an appearance of hairs.

203. Pili are sophisticated multipart powered machines utilizing simple machines like levers, wedges, ramps and screws transforming or redirecting energy to perform work. Like commonly understood machines they have coordinated, moving, separate parts with separate purposes. To describe them as anything other than *machines* is incorrect and casuistic.

204. Cell microscopy is revealing the controlled, organised and coordinated non-random collection of specifically functional versatile machines in the cell carrying out the complex physico-chemical processes on which life is based; proton pumps, chemical factories, protein factories, protein folders, shredders, clocks, outboard motors, switches, winches and harpoons... the parts of which are dimensionally precise and orientated in 3-dimensional space suitable for assembly elsewhere.

205. The machinery is constructed of protein, nucleic acid, fats and sugars. These components, in the majority of cases made from only six atoms, namely, carbon, oxygen, nitrogen, sulphur, phosphorous and hydrogen.

206. Machines are not rare or exceptional in any living cell; instead, the presence of machinery is the rule, not the exception.

207. Cellular machinery is not crude. Sophistication, finish, and elegance in the machinery is the rule, not the exception.

208. No unicellular life is without machinery. Machinery made of protein. And no life exists without proteins.

209. *Proteins* are very large complex organic molecules, not blobs of undifferentiated plasm, consisting of very many joined amino acids having a first appearance of long tangled chains. Precisely folded, they are, tangled, they are not. Abundant they are as well; the number of proteins in an e-coli cell is over two million and the median number of amino acids in any one bacterial protein is over 250.

210. The earliest bacterial cell to appear on earth needed to have similar numbers to exist though the numbers are unimportant. What is important is that proteins are not available in the cell's environment; they are manufactured by the cell itself from raw materials. There are no life forms without protein. There are no naturally occurring protein.

211. The first living things had protein, protein is only made by living things. The circularity is inescapable.

212. It is possible to argue, without evidence, that the universe existed eternally and so escape the need to form explanations for its origin; it is impossible to say the same about life on earth; life did not exist eternally. It appeared suddenly.

213. Protein manufacture is carried on by a machine know as a *ribosome*.

214. The *ribosome* no matter how presented in drawings, gives an actual appearance of a couple of entangled balls of wool; it is

challenging to appreciate that it is, in fact, a machine.

215. A *ribosome* is not only a machine which makes protein; it is an integrated chemical system with organized subsystems or components in which the state of each component is limited by or dependent upon other units. Genetic information, stored in the DNA molecule, is translated by the ribosome to produce a string of amino acids which, after being hitched to each other like train carriages, fold into a shape that is now a protein that does something useful, or is an integral part of something useful.

216. The ribosome contains a part which double checks to be sure that there was no mistake in copying. The theory of evolution holds that evolution proceeds by a mistake in copying. It cannot escape the contradiction that, if this is true, the cell has evolved to prevent its own evolution through continually checking for accuracy in the copying process.

217. Usually a protein is defined as a polypeptide with molecular mass more than 5000 Daltons. Below this figure the protein is known as a *polypeptide*.

218. There are five major steps in the formation of a protein. In step one, in a multiplicity of sub- steps, the DNA is unzipped and a sequence of code is copied. Simultaneously, at another place, a protein known as messenger RNA is formed.
In step two, messenger RNA picks up then carries away a copy of the DNA. Again, multiple steps.

In step three, messenger RNA substitutes a U for the T in the ATCG code
In step four the ribosome receives the package from the messenger RNA and constructs a chain of amino acids.
In step five the chain is folded then transported to its destination.

219. *Unzipping* is an action accomplished by powered *helicases*, enzymes that bind and may even remodel nucleic acid or nucleic acid protein complexes. Words ending in *ase* denote enzymes, this is an enzyme for the helix. They are critical during DNA replication because they separate double-stranded DNA into single strands allowing each strand to be copied. The process of unzipping, more properly breaking the hydrogen bonds between the nucleotide base pairs, requires energy. Helicases use the energy stored in an ATP molecule.

220. *Folding* is intricate. The amino acid sequence of a polypeptide plays a central role in the three-dimensional shape that the polypeptide assumes. This shape results from folding of the amino acid chain on itself and is stabilized. While the amino acid sequence determines what the final shape of the folded protein will be, proper folding is often furthered by other proteins called *chaperones*.

221. The steps are rapid, detailed, intricate and follow in precise order. The first cell on earth possessed the ribosome, the RNA and the DNA, the helicase enzyme, and the ATP for power; all

five. One is ineffective to produce proteins absent the other. It is boldly asserted that all these ingredients and these steps must have come about through chance association of inert chemicals. It is so asserted in because there is no other explanation short of a super-natural one. The unbelievable luck is cheerily admitted by popular expounders of the origin of life. The odds against one of the five appearing are in the trillions.

222. The earliest bacterium a is a formidable example of the power of nanotechnology. Almost everything occurs at the atomic level, the level of atoms. Individual atoms are slid into place from one spot to another to build a molecule. Even single photons of light are secured and further the passage of single electrons through electrical circuits driving the electric motors. Individual molecules are pushed and pulled into shape or transported Molecules are packaged and transported expertly over distances of a few nanometers. There could be up to a thousand reactions going on at the one time.

223. Proteins do not exist in isolation but cooperate or collaborate. The great polymath and Nobelist, Paul Ehrlich stated, *Corpora non agunt nisi ligata,* meaning a body is not effective unless it is linked to another. Significant, not because Ehrlich pronounced it, but because it is a powerful principle. It is an instruction to study any protein holistically and recognise that a whole *system* for the production of proteins does not appear

fragment by fragment.

224. A protein map of the simplest bacterial cell demonstrating merely the various proportions of functional proteins, such as those for transcription, folding, sorting, degradation, DNA maintenance and translation, enables an appreciation of the hundreds of different categories of proteins collaborating in some particular aim, such as movement. A cursory search on the internet for *protein map* will display dozens of different maps as one is insufficient to follow functions and synthesis of the hundreds of proteins in a cell. A view will dissuade any thought of simplicity and, when seen for the first time, will confound and astonish.

225. As the median length of a protein is over 250 amino acids, of which there are 20 common kinds, inescapably the number of possible amino acid sequences in a protein is astronomically large; trillions upon multiple trillions. Among these, the proportion able to fold and perform biologically useful functions as proteins is fadingly slight.

226. To appreciate what is involved in the odds; *The Pools* is a British nationwide lottery based on Australian and European football (soccer) matches. A single game of The Pools requires a participant to choose 6 numbers from 1 to 38. The numbers represent games played and if the 6 chosen are the highest scoring drawn games that is first prize. The chance is one in nearly three million; 2,760,681. Predicting the actual scores in

a mere 38 can be compared with doing predicting the correct sequence of 250 amino acids of 20 different kinds to produce one protein irrespective of its eventual utility.

227. Assuming favorable prebiotic conditions, and assuming maximally fast reaction rates between no more than the chemical constituents of DNA and RNA, calculations have induced considerable skepticism of insufficient time between water first appearing on Earth and the appearance of the first prokaryotes to enable random chance to find a selection of useful proteins capable of forming a cooperative suite. Nevertheless, random chance is the established, unproven, paradigm or dogma for the appearance in the first living cell of the simultaneous aggregation of a molecule containing instructions in code for the building of the proteins, the machine to do the building, the motor to run the machine, the power source to run the motor, and transporters to take the protein parts to a location for assembly.

228. $C_{14}H_{18}N_2O_5$, that is, 14 atoms of Carbon, joined with 18 atoms of Hydrogen, two atoms of Nitrogen and 5 atoms of Oxygen make up the simple amino acid Aspartame. Change any one of the numbers 14,18,2,5 and it is not Aspartame. Keep the numbering but change one of the elements C H N O and it is not Aspartame.

229. *Amino acids* are contemporaneous with life. They are produced as they are today, in situ, in living cells. There is no

money to be made prospecting for an amino-acid mine. They can be synthesised in a laboratory; but there is no evidence whatever of synthesis in nature using gravity or lightning or volcanic hot gases or other elemental forces, not even the sun. Amino acids are not found on earth outside a cell. Discovery of amino acids on comet debris are discounted as likely arising from contamination. It is claimed that the simplest amino acid, glycine, the only amino acid to form in the absence of water, was once detected in the coma of comet 67P/Churyumov-Gerasimenko.

230. The importance of proteins lies in their what they do, rather than what they are. All proteins in a cell are shaped to fit another protein and work.

231. There is an immense mismatch, and no reasonable comparison, between the chemical composition of a living cell and inanimate matter of equal volumes. There are no known life forms without proteins. Life without proteins is impossible; impossible, not tough, or arduous, or difficult.

232. A bacterium's pilus can harpoon another bacterium then inject a toxic cocktail into their competitor causing cell dissolution and death. The predator bacterium can then integrate the released genetic material.
In passing, this lateral transfer of genetic instructions is an example of evidence that prokaryotic natural variation is different to that in eukaryotes foreshadowing a likely to be

abandoned hypothesis for an evolutionary path of prokaryotes to eukaryotes, that is, from bacteria to fish to dingoes to apes to humans.

233. That bacterial toxic cocktail was not purchased at a pharmacy, nor does it form a unit of the environment. The cocktail is many molecules of protein and was created by the cell utilizing efficient chemistry.

234. Bacteria are prolific producers of toxins to kill or inhibit closely related species; over 25 named toxins have been identified so far. $C_9H_{11}N_2O_4S$ is the chemical formula of a toxin produced by a bacterium and known today as penicillin; a precise arrangement of atoms of Carbon, Hydrogen, Nitrogen, Oxygen and Sulfur arrived at unintentionally by pure luck as the bacteria try one combination and permutation after another according to evolutionary principles. The same applies to the other 24 toxins.

235. In what way these earliest living things, prokaryotes, came to produce such sophisticated chemicals at the dawn of the emergence of life is a seriously neglected aspect of evolutionary study.

236. Other types of bacterial pili inject, with very high force, the equivalent of a dart into a host bacterium then strongly coil to winch the two cells closer. A protein bridge is assembled between the two and a DNA sequence called the fertility

factor, or F-factor is transferred from the bacterium to the host cell through the bridge in a process similar to, but not, sexual conjugation. The bacterium does not carry on this operation randomly but only with F^- bacteria as it is an F^+ bacterium. The number of intricate steps involved in this entire operation is material for an entire book and must be left to the imagination because of space restraints.[1] The DNA sequence is known as a plasmid and may contain hundred of genes and thousands of atoms precisely arranged.

237. A pilus is a rapid action, organic molecular machine describable as a flexible combination of a line-attached barbed missile, a winch, and a hypodermic needle. The winch is accomplished through the pilis' length being dynamic and variable; elongating by molecules engaging in a chemical reaction to form chains and shortening by another reaction. A modern tranquiliser dart gun is a much simplified, reduced and incomplete parallel.

238. Other pili are different molecular machines in that they can act like grappling hooks. In a series of jerky twitching moves they attach the grappling hook, release the grappling hook, re-attach, repeat, repeat and, in this way, move and attach to a surface, if required. When attached, they can resist flushing and form colonies. Cholera does this, attaching to a host cell, colonizing, and killing.

239. The motive power for the pili's grappling or winching or firing is contained in a *motor* situated at the base of a pilus.

240. The term *motor* is not metaphorical; molecular biological motors are well established. They are actual motors by common definition of such, often harnessing, as in the case of a pilus, energy released by a double decomposition of ATP; Adenosine Triphosphate.

241. The motor at the base of the pilus appears to be a linear motor that pulls making the pili a retractile pili and demanding that the pilus itself necessarily be strong enough to withstand great strain without breaking or becoming deformed; *high tensile* in other words, and analogous to the various strengths of fishing lines, except that the pilus is hollow as a hypodermic needle is.

242. The retraction of the grappling hooks must inevitably cease at some juncture, and the cessation is effected through a stop/go switch in the motor. Retraction completed, it is now necessary to extend the pilus forward and tether or adhere to the surface it is moving over.

243. Long familiarity with light switches holds back appreciation of the overwhelming complexity of switches in a living cell. They are a subject in themselves of widespread active research and, once more, would fill a book.

244. Parameters in the cell must stay under control within a narrow range around an optimal level. Switches accomplish this

stability or *homeostasis* when triggered by numerous types of positive and negative regulatory circuits. Negative feedback loops tend to slow, or stop, a process while positive feedback loops initiate or accelerate it.

245. *Homeostasis,* in this instance, refers to self-regulating processes that the bacterial cells use to maintain internal stability; guaranteeing survival. The main homeostatic processes that guarantee the survival of bacteria are iron homeostasis, other metal homeostasis, pH homeostasis and membrane lipid homeostasis. Bacteria possess protein metal sensors which can sense and regulate the internal levels of both toxic heavy metals and beneficial metal ions. There are also mechanisms for sensing external changes to pH, and the lipid or fat composition in membranes.

246. Absent these and other sensors, feedbacks and switches a bacterium is a dead bacterium. First life required sensors, feedback and switches. Even protobionts needed them or they would not survive, and it is truly remarkable that inert chemicals accidentally constructed same in some primitive or reduced form if current theory of the origin of life is taken seriously.

247. A protobiont or protocell is an indefinite abstraction existing in a multiplicity of theories. Essentially, theorists are in common agreement that original life arising by chance is hopelessly improbable. It is assumed that inanimate matter simply forms

itself into life at some point, obedient to a law of its nature. It is not known what factors underlie the laws or why the law is not working now when conditions are more favourable than they were four billion years ago. This is an argument from desperation at the realisation that no other is conceivable if naturalism as a philosophy is not to fall to earth. Briefly, it is argued that these unknown laws must exist simply because life exists; chance is powerless and the super-natural is dismissed a priori therefore there must be some physical reason expressible in laws.

248. A switch is one apparently simple movement requiring extensive repetitive two-way feedback or signaling and strong synchronicity as movement may only be accomplished by coordinated activity. A computer program for this one twitching form of motility would be characterized by a plethora of steps involving many *if-then-else*s and *do-until*s. One action, many steps. The program for the chemical production of toxins is equally lengthy and detailed.

249. The energy source for the motor is a charged ATP molecule which is produced by an associated and different machine called the *ATP Synthase*.

250. *ATP Synthase* is a complicated system and basically comprises twin electric motors, the F_0 and the F_1, each of which has multiple sub-units. The F_0 is a sophisticated and highly efficient motor unit powered by hydrogen ions flowing from

outside the cell's environment across a gradient. The F_1 has a central stalk and rotor that, when turned, converts Adenosine Diphosphate and Phosphorus into ATP. Its discovery resulted in a shared Nobel Prize for Professor Boyer and Dr. Walker. It strains belief how any imagined *protobiont* could engineer a proto ATP Synthase which had fewer parts and still be operative.

251. For F1 to work, all five parts, denoted by Greek letters alpha, beta, gamma, delta, and epsilon, are needed. For F0 to work, all three parts a, b, and c are needed.

252. As these highly organized molecules are required for life, their unexplained origin cannot be ignored. Only four basic methods of producing ATP are known; in bacterial cell walls, in the cytoplasm by photosynthesis, in chloroplasts, and in mitochondria. No transitional forms exist to bridge these four methods by evolution or any other theory. These ATP producing machines must have been manufactured as functioning units and they could not have evolved in one step, then a second, then a third… Anything less than an entire ATP molecule will not function and a manufacturing plant which is less then complete cannot produce a functioning ATP.

253. ATP synthase directly and constantly generates ATP molecules in the bacteria's plasma membrane and the molecules produced are used to power almost all respiration. If ATP synthesis stops, then life is replaced with death. No

protobiont, no model of first life can be without this machine.

254. Explanations of the appearance of molecular machines in order to accommodate the theory of evolution are forced to begin with an account of an already-living organism and, at minimum, a supposition of a basic molecular machine already in place; absent this, part of a purposeless molecular machine already in place which somehow combined to form a basic machine. Effectively, there is a straight line from unwarranted assumptions to foregone conclusions.

255. In order to explain how sterile chemicals could combine to produce the simplest form of machine it is necessary today to postulate explanations that there was a long series of invisible steps to numerous molecules randomly emerging as differently dimensioned, assimilable, parts of a basic machine. Afterwards, the parts self-assemble for a time, then pause for an *enzyme* molecule to appear to catalyze ATP to produce protons in a differently constructed machine. The two machine units connect, by chance, allowing a pilus to move. Else; that all parts of a basic pilus and a separate basic motor were created simultaneously in a blizzard of chances in a blink of an eye.

256. The self-assembly of parts of a cell is regarded as highly interesting, scarcely more. For comparison, imagine one brick *self-assembling* on top of a second. The machines do not self-

assemble. They are guided in a particular order by other proteins in most cases.

257. *Enzymes* are commonly large protein molecules which accelerate chemical reactions in the cell. Almost all cellular metabolic processes need enzyme catalysis in order to occur at rates fast enough to sustain life. A reaction that would take longer than the universe has existed can take place in a second. Life is impossible without enzymes. Current theory is that the enzymes must have come about by chance association of chemicals as they were indispensably present in the first living cells. Furthermore, given the ancient origin of enzymes, with some predating the buildup of atmospheric oxygen, it might be expected, if evolution is followed from simple to complex, that their catalytic chemistry to be simple instead enzymes that existed up to four billion years ago possessed many of the same chemical mechanisms observed in their modern-day relatives. There is no evidence of a precursor enzyme nor speculation as to its presence in any protobiont.

258. When an object is the first of its kind, as the pilus and motor are, there is speculation as to a possible precursor. In respect of the pilus, motor and ADP synthase it is candidly admitted that there is no evidence of a precursor.

259. Energy in a cell can originate in the electrochemical gradient whereby an ion can move across a membrane where there is a difference in solute concentration or unequal distribution of

charges across that membrane. It needs energy to build that membrane in the first place. The problem is that there is no coherent pathway proposed for the construction of the membrane without ADP synthase or some speculative precursor.

260. It takes energy
to fabricate the parts
and other machines
to assemble the parts
to build a machine
that supplies the energy
to construct a machine

261. It is seriously postulated that perhaps these machineries emerged before the bacteria needed them.

262. The primary goal of life is to live, the first living organism requires those molecular machines, in some form, to attain that goal. There is no evidence that inert chemicals ever came together to form so much as a simple lever or fastener, nor is there any model suggesting a plausible pathway.

263. No, pili are not simple hairs. And they don't grow on soap bubbles.

264. Pili did not take billions of years to evolve on a bacterial cell wall; they were unavoidably in place in the earliest organism

to allow for locomotion if nothing else such as defence. There is no model or pathway from inert chemicals to a functioning pili. Evolutionary theory offers no explanations as to how pili develop, not their origination.

265. The search for biotic precursors of the cell, and the myriad molecular machines in the simplest of organisms, parallels attempts to explain the universe's sudden appearance from nothing.

266. There is nothing to contradict the observation that the origin of life is as much a singularity as the Big Bang. The Big Bang was repugnant to the paradigm of an eternal universe; the sudden appearance of the prodigiously complex system of numerous molecular machines constituting part of life confronts the paradigm of evolution. The first cell had to be fully functioning otherwise there was no second cell.

267. There is a profound distinction between changes to an established genotype by mutation/selection on the one hand, and on the other, inert chemicals combining to create an intricate molecule storing genetic information for the replication of itself and the construction of a manufactory for the construction of protein-based machines, static structures, and toxins.

268. On the surface of the cell with the pili is the S-layer, S for Surface, the appearance of which is not unlike crystalline roof

tiles, but the composition and purpose of which is an unfinished chapter. The S-layer is of continuing interest not only for biologists, and manufacturers of biosensors, but also for nano-technicians looking for novel structural materials.

269. It exists in a single layer of proteins about 5 to 25 billionth of a metre in thickness. Its function is cell stability; protection from osmotic stress, other bacteria, enzymes, and from pH fluctuations, especially resistance to low pH acids. A great deal to ask for something 5 microns thick. Roof tiles or a suit of armour are simple analogies but S-layers break the analogy by integrating sophisticated pores and channels in each tile permitting through movement and transport.

270. The cell wall through the pores exhibits selective and localised porosity with no real analogy; perhaps a submarine constructed entirely of portholes, systematically opening here and closing there, expelling one substance, admitting another, conveys a limited picture.

271. The absolute necessity for a bacterial cell to have an S-layer or equivalent creates a paradox similar to the construction of a membrane to supply power to the machine that has to make the membrane in the first place. A cell needs a suit of armour to protect itself before building a machine to manufacture a suit of armour to protect itself.

272. It once was dogma that bacteria could not live in the acid environment of the human stomach and could not be the cause of stomach ulcers; helicobacter pylori with its S-layers disproved this belief.

273. Like the pili, the S-layer parts are manufactured by the cell, inside the cell, by molecular machines, and transported by other molecular machines for assembly on the cell surface at rapid rates.

274. S-layers, like pili, could not take billions of years to evolve; mathematically there was insufficient time to begin with inert chemicals and build to this highly complex protein.

275. Stripped to essentials, the postulation inherent in any explanation of the origin of the cell wall is that the roof tiles of the S-layer were generated by accident in a long series of inert chemical trials then lay dormant until a bacterium found a use for them after which the bacterium learned how to make them itself. Alternatively, the code for construction of the hard-shelled semi-permeable membrane and wall arose after a self-replicating molecule, a molecule many steps down from a protobiont, lay unprotected from death by watery disintegration, pH fluctuations and UV light until through a series of unknown steps a prototype cell wall was created with most of the features necessary for protection.

276. On the cell's surface, the protein glycocalyx covers some bacteria. Its first function appears to be protective; the presence of a glycocalyx increases the effective diameter of a bacterium and also covers up components of the bacterium that an adversary may detect. It also mediates cell attachment, retains humidity during exposure to dry environments, protects against molecular and cellular antibacterial agents (antibiotics, surfactants, bacteriophages, phagocytes) and other vital functions like size signalling. Glycocalyx could be understood of as an invisibility cloak which the bacterium cell weaves for itself or it can be better described as forming a complex, hierarchically organized network with specialised functions.

277. There does not appear to be an established evolutionary path in the glycocalyx from an early ingredient of the cell wall to its earliest known conformation, it seems to simply appear. Descriptions of pathways are hedged around with *apparentlys* and *possiblies* which seem to fit the very meaning of the word *glycocalyx*; sugar coating.

278. Glycocalyx and S-layer units are manufactured in the interior of the bacterial cell. They are delivered to the surface of the cell by *translocons*.

279. *Translocons* in prokaryotic cells are a group of powered protein machines distributed throughout the cell and charged with the responsibility of relocating or *secreting* other proteins

either onto the surface of the cell or uptaking into the membrane. They can also modify existing structures.

280. Examination of *translocons* discloses systems within systems, combinations and integrations of cell structures, chaperones, signals, docking maneuvers, folding of proteins, and energetics. Some translocons are complex self-assembling multicomponent machines, rapidly moving hundreds of other molecules. These may be said to be analogous to a fleet of self-assembled buses or vans equipped with sensors.

281. The sophisticated *Sec* translocon, for example, contains an exquisitely engineered enzyme protein with separate parts which facilitate recognizing, then moving, hundreds of different proteins into or across the membrane in a highly coordinated series of chemical reactions.

282. A much-simplified model of how translocons work with others is that of moving proteins to the cell's surface. A translocation channel is formed in the cell wall made up of a three-unit macromolecule shaped like an hourglass with a plug. During protein translocation, the plug is moved out of the way, and a polypeptide chain is moved using a *push-and-slide* mechanism through a pore ring of amino acids onto the surface. A primitive parallel would be a mechanical tile chain situated inside a house pushing a tile onto the roof.

283. There are an extraordinary number of paths taken for the translocation of proteins in a cell, a significant characteristic of each being the meticulousness of delivery of a precise only-that-and-nothing-else molecule to a precise only-there-and-nowhere-else location on a just-in-time schedule. Their creation from chance arrangements of chemicals is evidence-free.

284. The activity of a bacterial cell is nothing if it is not constant assembling and dismantling. Remove translocons and a bacterial cell is a dead cell. Without translocons a cell cannot come into existence in the first place. Translocons are indispensable. The protein particles for any of the numerous molecular machines cannot logically arrive in the order required for assembly as a result of being accidentally jostled by Brownian movement or thermal fluctuations.

285. The activity of translocons has no element of haphazardness. The protein particles to be transported are identifiable by robust *signals* comprised of amino acid configurations which the translocon is sensitive to; signals, and a signaling network which not only broadcasts information within the cell but adapts the response to the cell's current state are indispensable to translocon activity. Absent signals, translocons cannot operate, absent signals there is no life. Signals are mandated in first life. Signaling structures and translocons are complementary, operate as a system, and need both be present in the first living cell; there is no evidence that they were not.

286. Chance associations of lifeless chemicals may produce an amino acid, no evidence exists of chance associations ever producing any kind of integrated system. It has never been observed in either the laboratory or in nature at large.

287. *Streaming* in relation to movement inside a cell gives a false impression of the incessant never-ending movement in a cell as suggesting that passive proteins were aimlessly or helplessly being carried along on a current. The reality is that movement in a cell is much more akin to inner-city traffic with purposeful pedestrians and delivery vehicles with time-dependent and highly specific destinations.

288. Considering objects like pili as static separate unrelated entities hinders the appreciation of the fact that the cell is not a collection of independent entities. On the contrary, pili are components of a complex congruous functional system capable of sequential decision making.

289. The origin of a cell system is postulated to lie in numerous applications of physical and chemical laws extended over lengthy periods of time. No empirical evidence exists of random sequence complexity producing a single instance of sophisticated function in the natural world.

290. On the surface of the cell there are the flagella; whippy hollow hairs or hair, properly called filaments, bonded to a hook connected to the rotatable shaft of a motor.

291. The entire motor assembly is known as a flagellum and serves as a form of locomotion propelling the bacterium through its environment

292. The flagellum also serves as a sensory organelle receiving chemical and temperature signals. A limited analogy is a battery powered boat outboard motor; a lesser limited analogy is to a submarine capable of detecting through radar or sonar an enemy which has the same capabilities of detecting the submarine. The submarine can cut its engines and sink, effectively reducing means of detection. After an interval it propels itself from the area. If the submarine detects prey, situations are reversed.

293. The motor has the parts of a generic motor including the rotor, stator, drive shaft and the usual rings and bushes including a clutch and a universal joint linking to the flagella. It is a self-assembling, self-repairing, water-cooled rotary engine with two gears forward and reverse, able to reach between 6,000 and 17,000 rpm when disengaged. With a short-term memory; it is a multipart, tightly integrated, functional system. There is nothing simple about it; nor any of its component parts.

294. The motor is assembled from parts made of protein

295. All proteins bind or stick or attach to other proteins. In some cases, binding is unyieldingly close; in others, frail and temporary. The binding expresses great particularity and exactitude in that each protein molecule can generally bind just one or a few molecules out of the many thousands of different types it comes across. The substance which is bound to the protein, an ion, a micro molecule or a macromolecule is referred to as a *ligand* which recalls to mind Erlich's remark, *Corpora non agunt nisi ligata,* translating as *a substance is not effective unless it is linked to another.*

296. The capacity of proteins to bind so particularly to a ligand hinges on weak hydrogen or ionic bonds, intermolecular forces and hydrophobic interactions. Each individual bond is weak and many bonds must arise simultaneously; possible only if the surfaces of the ligand meticulously match the surfaces of the protein.

297. The probability that a functionless proteinic molecule machine part formed haphazardly from one of trillions of chemical configurations possible and lay stable until accidentally a second of the millions of possible proteins formed with the precise characteristics in dimensions, chirality and polarity to enable it to bond with the first cannot rationally be accepted.

298. The probability that the two parts formed a functionless unit and lay stable until a third formed accidentally from similar chemical elements is less capable of rational acceptance.

299. The flagellum can switch the motor on and off, and accept a load needed at a specific location and hand it over at the destination.

300. The flagellum motor is made entirely of protein, folded in different shapes, composed of about 30 different proteins with copy numbers ranging from a few to a few thousands, self-assembled and located at an anchor point on the inner cell membrane. It is powered by a proton pump of ions delivered as a flow across the bacterial cell membrane instigated by a concentration gradient set up by the cell's metabolism.

301. A bacterium engages or disengages the motor by operating the clutch. The impetus for starting and stopping is triggered by signals detected in the surrounding environment by the surface flagella then transduced by virtue of an elegant circuit. Once disengaged, the bacterium tumbles and settles. If the clutch is engaged during tumbling the bacterium is redirected in the direction faced upon re-engagement of the clutch; in this manner the flagella act like a rudder directing the bacterium to a favorable environment or away from an unfavourable one.

302. Stators are so called because of its stationary role as the non-rotator, but the composition of stators in the bacterium flagella is highly dynamic. Experiments have shown that stators could incorporate themselves into and restore rotation to paralyzed flagellar motors, with each successive stator incorporation

resulting in a stepwise increase in motor speed and reduction in torque.

303. The entire flagella assembly is about a millionth the size of a grain of sand and is one of three proteinic motors in prokaryote cells which have been unambiguously identified as rotary engines.

304. The flagella are connected to the drive shaft of the motor by a joint, termed the hook, which is analogous to a universal joint. This allows the mechanical transmission of torque power between the two unaligned points. Additionally, the hook is flexible enough to bend while enabling the filament to adopt a wide range of angles relative to the motor axis and cell wall but still continue to be rotated at all angles within the range. Assuming that current thought in biology is correct, and that a protobiont emerged from fortuitous arrangements of lifeless chemicals, it is a remarkable example of how such inanimate chemicals can spontaneously and accidentally form into a separate part like the hook independently of the motor and the filament.

305. The flagellum hairs grow out of the bacterium body in exactly the same way that body hair doesn't; it grows and is assembled at the *end* of the hair, rather than the base. The thousands of individual parts are driven through the central channel of the flagella, about 2 nanometres in diameter, by another molecular machine; on this occasion, a pump powered by a proton

motive force. Prokaryotic cells generally are able to exquisitely measure and regulate not only their overall size but also that of their organelles or parts. And regulation of organelle size is perhaps most apparent in the regulation of the length of the filaments.

306. In a sense, the parts of the flagellum filament are mass produced, each of exactly the same dimensions and each of the exact same material.

307. As there is no consensus how the bacterium *knows* dimensions of its parts and when to stop, so there is no explanation indicating from whence this quality evolved. Evolutionary principles are settled that *everything* in life evolved from *everything* else in life but eschews how *anything* got there originally.

308. Each filament has a dynamic five-legged *cap* critical to assembly; without the cap's presence the filament parts when delivered will leak into the environment, particle by particle. It flexibly adjusts conformations to keep one flagellin binding site open, providing a cap rotation mechanism for promoting flagellin self-assembly.

309. The *cap* is pentagonal in shape with five 'legs' of similar but different specific curving and tapering shapes. Overall, it is not a shape reasonably to be anticipated by any known mathematical, chemical or physical law. It is shaped to

perform a specific function, it is useless for any other purpose and critical to the flagella.

310. The cap is an excellent example of biological scientists correctly deducing, from observation, shape and size, the function of the protein cap. If one has no experiential or other background knowledge of the function of, say, a simple wooden stool, it could be studied, measured, photographed, x-rayed and chemically analysed in detail by a four-legged intelligent alien without such alien ever knowing that the stool is simply something to be sat upon and that three legs is a prerequisite for stability on uneven surfaces. A background and knowledge of the machine kingdom is inherent in this wholly admirable feat of deduction.

311. Components of the flagella may resemble components of a differently functioning machine located elsewhere in bacterium, but locating a component or subsystem of any machine which performs some other function is a poor argument for the machine evolving from that other machine. Multipart, tightly integrated machines almost invariably contain multipart subsystems that serve some different function. It is the machine's original function as an integrated system that's in question – not the components. A lever and an inclined plane are functional single part tools that do not become functional until they are part of a system.

312. Comparing the injectisome with the flagella, a comparison frequently made, does not differ considerably from comparing an electric rotary cutter lawn mower with an electric rotary cutter shaver with the intention of claiming that one evolved from the other.

313. The comparison is meaningless in any case. The fact is that the flagella is contemporaneous with the magnetotactic bacteria, and the magnetotactic bacteria are indubitably among original living organisms. Consequently, protobiont theory requires the conclusion that the numerous parts were created separately, fortuitously and accidentally from non-living chemicals, which is absurd. Alternatively, that some primitive form of DNA designed a primitive flagellum which is even more absurd as evolutionary theory holds that evolution acts as blindly and as purposelessly as inert chemicals do.

314. Attempts to show the evolution of the flagellum are embarrassingly unconvincing. One claims the bacterial flagellum beginning with an already- in-place hypothesised motor with 11 stators and progressing upwards in power as new stators arise by mutation. Others pre-suppose exaptation by the injectosome. It is not unfair to say that these attempts ignore the fact that the most significant thing is the electronic motor itself. In effect, explanations begin with assuming a motor; a something for which there is no precursor. As far as can be determined, the flagella predate the arrival of the injectosome in any case.

315. One fact in favour of the flagellum-first view is that bacteria would have needed propulsion before they needed injectosomes', which are used to attack cells that appeared later than bacteria. Also, flagella are found in a more diverse range of bacterial species than injectosomes'.

316. The flagellum is relatively easy to comprehend and visually arresting. Its appearance pronounces that it is a machine; re-orient the motor and it has similarities to an electric drill or a Mixmaster. The same cannot be said of the very machine that made the parts of the flagellum, the *ribosome*.

317. Evolutionary theory holds that new types of protein could emerge from an existing protein via gene duplication and subsequent divergence but the question is what created new proteins from scratch since it takes a protein to make a protein. An answer was the concept of an original, initial world, the RNA World, where RNA molecules did the work of proteins. In this imagined world, beginning with necessarily assuming the existence of RNA molecules, prebiotic ribosomes evolved in six phases, firstly sequentially acquiring capabilities for RNA folding, then for catalysis, then for subunit association, then for correlated evolution, then for decoding, then for energy-driven translocation, finally for surface proteinization. Each of these steps makes it sound easy. None of these phases has been observed and are still theory.

318. The theory is that RNA was the first genetic molecule to arise around 4 billion years ago, but in a primitive highly versatile form that later *evolved* into the RNA we have in life today. No form of RNA, primitive or otherwise with the capacity to evolve from inert chemicals has been demonstrated. A *reaction* important for *something like* RNA molecules to *form* has been demonstrated.[2] The high-water mark of the theory is

that scientists have demonstrated a possible way for molecules that might have been there four billion years ago might represent a starting point for RNA. No more.

319. The RNA World is a hypothetical point in a theory of naturally occurring molecular evolution from inanimate chemicals. Only one fact concerning the hypothesis is settled: if the RNA World ever existed, it ended without leaving one unmistakable trace of itself.

320. Completing or supplanting the RNA world hypothesis is a revival of the First Came Protein hypothesis; that is, proteins as the original self-replicating biomolecule.

321. For many scientists studying the origin of life the greatest chicken-or-the-egg questions is: which came first, nucleic acids or proteins. Life theoretically needed, at the outset, long polymers that had a capacity to self-replicate *and* to perform functions essential to life: namely, storing information and catalyzing chemical reactions.

322. For most of life's history, nucleic acids have handled the task of storing information; and proteins the job of catalysis. Yet DNA and RNA carry the instructions for making proteins, and proteins extract and copy those instructions as DNA or RNA. Which one could have originally handled both jobs on its own? For decades, the favoured candidate has been RNA — particularly since the discovery in the 1980s that RNA can also

fold and catalyze reactions, much as proteins do. Later theoretical and experimental evidence further bolstered the "RNA world" hypothesis that life emerged out of RNA that could catalyze the formation of more RNA.
But RNA is incredibly complex and sensitive to environment. And both RNA molecules and proteins must take the form of long, folded chains to do their catalytic work while the early environment would have prevented strings of either nucleic acids or amino acids from getting long enough.

323. The answer lies in foldable polymers. Firstly, a monomer arises in the prebiotic soup, which exposes a hydrophobic patch. Then other similars float past and one is attracted to the patch linking up under laws of thermodynamics making a longer chain. Then on it goes. It is proof of concept at this stage, no more. The chicken and egg conundrum is as inflexible to solution as it was at the beginning and the theory is threadbare.

324. The word *mutation* and the phrase *natural selection* occur in every description of the theory of evolution. Neither the word nor the phrase occurs in mathematics, physics or chemistry. No differential in calculus, differential geometry, algebraic geometry or algebraic topology mutates into another differential, no atom of an element proceeds by way of natural selection to an atom of another element. The term *evolution* is inapplicable in a prebiotic earth. *Evolution*, if and so far as it occurs, only occurs once life begins. If a collection of inert

chemicals combines in a pre-biotic world to produce a molecule it does so by chance, proximity, and established laws, it does not evolve. If those chemicals do produce a molecule possibly similar to an organic molecule, by other existing laws the molecule quickly fragments without leaving any evidence, or trace of its passage.

325. How the flagella works is not simple, but it is, at bottom, something anyone familiar with household machinery like vacuum cleaners can appreciate. The same cannot be said of the *proteasome*.

326. Abnormal proteins arise through mutation, spontaneous degradation, free radical damage, temperature damage and misfolding mistakes. To avoid toxic levels in the cell, they are assigned prompt removal. Expulsion is executed by a machine with limited characteristics of powered paper shredders or chemical mills, called *proteasomes*. They are, more particularly described as multicatalytic degradation machine*s* with a central role in the regulation of the cell.

327. Doing the job in bacteria are proteins with several enzyme sub-units arranged in a two-layered ring and an ATPase. Essentially the ATPase recognises abnormal proteins and delivers them for execution.

328. As well there are compartmentalized twin barrel shaped machines found in some species of bacteria, and archaea, consisting of two separate protein complexes. The first is a gatekeeper which recognises multiple tags or signals previously placed on the abnormal protein then basically untangles the abnormal protein roughly analogously in the way a woollen pullover may be unpicked. The second unit chemically decomposes or digests the protein after the threads have been fed into it. The proteins are digested into short polypeptides and amino acids then are recycled for new protein synthesis.

329. Several other cellular mechanisms are involved to deal with such potentially toxic protein species; misfolded proteins, for

example, are mostly recognized by *chaperones* on the basis of exposed hydrophobic patches and, if the *chaperone* is unable to refold them to their native state, they are targeted for destruction.

330. *Chaperones* are proteins that help the folding or unfolding of proteins and the assembly or disassembly of them or other macromolecules. They are yet another class of powered molecular machines; powered, in this case, by ATP. Their primary function is to maintain a stable state of optimal functioning in the cell fundamentally by protein quality control. They do this by preventing the misfolding of proteins or assisting folding to get it right in the first place, refolding degraded or impaired proteins, small monomer assembly, and guiding failed repairs to destruction in the proteasome.

331. If successful in rigorously maintaining stability in the cell then, logically, chaperones, when successful, impede mutation-triggered evolution to a new variety; a paradox equivalent to the error-checking inherent in the ribosome. In this view, life has evolved mechanisms to prevent life's evolution.

332. Chaperones are abundantly and necessarily present in the earliest known life forms; and with their complexity in structure and manifold differences in function there is no plausible explanation how they could have emerged contemporaneously with life from inanimate chemicals to lodge in a protobiont.

333. Many of these chaperones fall under the category of heat shock proteins machines. They are labelled on the basis of their molecular weight, for example, HSP40, and have many different functions. HSP40 delivers to HSP70 a newly formed amino acid chain, or one that has become unfolded, HSP70 takes that molecule, helps it to fold into its proper functional form and then releases it. The comparison with a modern industrial assembly line comes readily to mind. HSP60 attracts a new amino acid chain or a protein that has lost its structure and envelopes it. Chemical forces inside the structure, or cage, help the protein to assume its correct folded shape. HSP90 receives folded proteins from other chaperones and helps to join them into a larger protein structure.

334. Chaperones are encoded by specific genes and are produced under stress conditions; analogous to Civil Defence Units standing by. There is no explanation or theory allowing for inanimate chemicals having foresight to create a sequence in any prebiotic DNA or RNA for a gene for a possible eventuality.

335. Evolutionary mechanisms, by very definition, are without capacity for intentional provision of assimilable components for machinery itself suitable for an anticipated future need. Further, evolutionary theory demands an absence of foresight in an organism to plan a system of machinery and to drive and halt such machinery. These point inexorably to the

impossibility of much simpler chemical interactions having such capabilities. And specific ways that evolutionary mechanisms might successfully overcome such hurdles have not been empirically shown and are merely suggested or assumed without evidence. [3]

336. The discussion of bacterial morphology has been dominated by morphogenesis questions about how a cell manages to create a rod shape, which is but one example of the more general question of how a cell constructs *any* shape. Absent that information the researcher is constrained in proposing a model for the pre-biotic protobiont. With this fundamental question at a stalemate, any proposition of the imagined protobiont is in the same or worse position.[4]

337. If there ever existed a pre-biotic protobiont its first requirement is to have some kind of morphology. That morphology could not come from molecules formed by inorganic chemicals. The shape of inorganic molecules so far as is known is determined by the VSEPR theory; abbreviation of *valence shell electron-pair repulsion theory*. This produces a very limited number of shapes, basically linear or pyramidal shapes. None of the shapes remotely resemble the rod shape of the earliest life forms. More importantly, the shapes are un-articulated and inflexible.

338. To produce the morphology of the bacteria it is necessary to make a presumption, namely that the chemical components found in all prokaryotes were present in the protobiont from which all life derived. Or to expand; the spontaneous interaction of the molecules created from these chemicals present in the early earth's atmosphere formed more complex organic molecules, such as amino acids, sugars, fatty acids, and nitrogen bases. The ingredients of this soup, the recipe for its existence, its capacity to prolong the life of its components is guesswork. The guesswork reflects itself in the absence of a demonstrable actual protobiont.

339. The paradigm of abiogenesis in a primordial soup was developed at a time when the earliest living cells were considered to be exceedingly simple structures that could mutate, and with natural selection and descent with modification lead to modern morphologies. After the discovery of the exceptionally intricate molecular constructions involved in proteins the paradigm should have been, but was not, cast off. Modern ideas of abiogenesis have developed into advanced speculations with little or no evidentiary backing. It is fair to say that it is increasingly held, now the matter is under the consideration it hitherto lacked, that no plausible scenario exists for the complexity and sophistication of life to originate from non-biological matter.

340. There is no ‘finally’ with life. There is always more. That ‘more’ in this case is the *endospore*.

341. When a certain bacterium of a certain phylum, the Firmicute, senses that it is running out of food and water; or conditions are shifting to the unfavourable end of the spectrum; it endosporulates to coin a word, it reduces itself to a stripped-down, dormant form, the *endospore*.

342. Firstly, using a selection of molecular machines to break open the DNA double helix, the Firmicute bacterium utilizes various other machines to copy, translate, and replicate its own DNA then uses a machine to move the copied DNA to the other end of the cell. Next, other machines construct a heat-proof, UV proof, plasma shield around the new DNA. Then another machine constructs a tough internal wall around itself and the DNA.

343. Then it lives – sometimes for centuries - by eating its other half on the other side of the wall.

344. As could be expected, given the conditions of Earth when life began, the Firmicutes are agreed upon as being among the first bacteria.

345. One could say it is improbable that inanimate chemicals would give rise to a molecule that could give rise to another which, by sheer accident, could give rise to third that inserted a code into another molecule that enabled it to plan ahead so that,

when this entity eventually got life, it was equipped with a sophisticated routine of many steps to ensure it stayed alive, and, instead of reproducing by fission every thirty minutes, just shut that routine off when conditions changed for the worst, and went to sleep.

On the other hand, one could say that a protobiont with foresight like this never existed; and the notion that the protobiont arose from chance association of atoms is beyond rational belief. As Nobelist, Christian de Duve, put it, *Life is either a reproducible, almost commonplace manifestation of matter, given certain conditions, or a miracle. Too many steps are involved to allow for something in between.* De Duve believed life was reproducible, almost commonplace, and died holding that opinion.[5]

346. De Duve's statement does not get its standing because it was an eminent scientist who articulated it, but because it is an eloquent, elegant and brilliant summary; *Life is either a reproducible, almost commonplace manifestation of matter, given certain conditions, or a miracle*. In spite of hopeful announcements of imminent reproducibility life has not been reproduced and, with each dead end, the *almost commonplace* expectation grows increasingly unlikely. Should it ever occur it will not be commonplace.

347. That was the cell wall and the flagellum – now the membrane.

348. The membrane is made from a double layer of oily or waxy compounds, fats, called lipids and is riddled with more than fifty different proteins.

349. Perhaps the most important of the functions of those proteins is transporting water-soluble substances, food and waste, in and out of the cell through that membrane.

350. There is no comparison between a working cell membrane and the primitive, useless, bi-lipid postulated in origin scenarios.

351. Passage of substances through the cell membrane is tricky, the membrane is particular about what molecules may pass through. And there is an unceasing traffic.

352. The membrane can be thought of as a Berlin Wall with its Checkpoint Charlies, Checkpoint Bravoes, Checkpoint Deltas complete with water filled tunnels along which the nutrition and waste passes.

353. This part of the cell envelope of the first living creatures is not some sort of static defence like a castle wall, but is dynamic and actively complex, more in line with a combined customs barrier and blockade.

354. Passage is sometimes achieved by simple diffusion whereby molecules and ions of water and carbon dioxide move spontaneously, without expending the cell's energy, down their concentration gradient; in other words, from a region of higher to a region of lower concentration. This is an instance of compliance with the Second Law of Thermodynamics - whereby energy tends to disperse from a localised to a more spread out form, if not hindered from doing so.

355. In other cases, powered chaperone proteins actually bind to the molecule in question and move it against the concentration gradient then release it at the other end, analogous to a porter carrying luggage, or an armed escort clearing a passage, then returning for the next customer.

356. This does not exhaust the complicated variations in how a cell goes shopping or puts out the garbage and, as both are indispensable for life to exist, these complex mechanisms are necessarily in place in the earliest life, even in the simplest workable imagined protobiont. No membrane/wall has been constructed artificially.

357. *Magnetotactic* bacteria are ubiquitous, aquatic, motile microorganisms which passively align and swim along the Earth's magnetic field lines to find their way; comparable to the way chemotactic bacteria negotiate their own particular environment by detecting chemicals.

358. Magnetotactic bacteria were/are anaerobic and because these organisms thrive in environments that lack oxygen, it is believed that these microbes represent some of Earth's earliest inhabitants and must, of necessity, have been present at the origin of life. Earth's original environment contained little or no oxygen.

359. Iron is an essential nutrient for all organisms and is particularly important in magnetotactic bacteria not only because iron functions as a compass but, additionally, as a protein cofactor for numerous metabolic pathways.

360. The magnets are fashioned, manufactured or generated by the bacterium itself. One may generate the magnetite crystal outside the cell while others generate the crystal in vesicles inside the cell. How a bacterium *knows* that it needs to construct a magnet in the first place, then *knows* how to gather the iron for the magnet, then *knows* how to construct a magnet from the iron, then *knows* how to formulate a code for the DNA chain so that its offspring or descendants does not have to repeat trial and error, then *knows* how to utilise the magnet is an unknown. One can take trial and error, blind chance and cosmic imperatives only so far before the mind rebels. The

word *knows* is commonly not used in biology papers; the word *senses* is preferred.

361. Terms like *knows*, *senses*, or *foresees* are terms properly appropriate to animals, particularly humans, with cognitive facilities but are forced upon biologists to describe events in plants and animals lacking such facilities.

362. The biosynthesis of magnetosomes is a complex process which involves several distinct steps including cytoplasmic membrane modifications, iron uptake and transport, initiation of crystallization, crystal maturation and magnetosome chain formation. Magnetotactic bacteria contain in the magnetosomes unique sets of proteins not present in other cellular fractions to control the biomineralization process.

363. That all this knowledge was present in the earliest known life is one of the knowns; that a bacterium may have anything from ten to twenty magnetosomes is another. But in what manner a bacterium biomineralized a tool for navigation suggests naturally something other than blind chance at work. Without disparagement; explanations as to origin are a valueless row of guesses.

364. It has been observed that biomineralization in magnetotactic bacteria provides highly uniform magnetite crystals with narrow size distributions. In contrast, man-made magnetite crystals have low crystallinity and broad range of sizes.

365. That this magnet is used by bacteria to orientate themselves within Earth's geomagnetic field and then use their flagellum

to swim to oxygen-poor sediments where the oxygen levels preferred by them are found is indisputable.

366. It is logical that, because magnetotactic bacteria possess a flagellum, then the flagellum with its intricate machinery and electric motor was also there at the point of origin of life; it existed when the only source was at best an as yet undescribed reproducing molecule. Some researchers suggest that the common ancestor of all Proteobacteria was magnetotactic[6].

367. That some protobiont magnetotactic bacteria were allegedly assembled by chance arrangements of available chemicals, or the cosmic imperative, at the very beginning of life and managed to incorporate a tool to fabricate magnets of quality is the only explanation given, unless they came from another planet which also had magnetotactic bacteria. It must be said that there is no evidence for either speculation, and considerable space is available for other theories not requiring evidence.

368. In certain bacteria, some protein molecules suspended in the cell membrane are capable of *photosynthesis*; the cyanobacteria….

369. Cyanobacteria are so called from the Greek kyanós meaning ‘blue’. They are the most successful group of microorganisms on earth with the capacity to live where others cannot. Cyanobacteria also possess a facility to enter a dormant state, to awaken when conditions improve. This is unsurprising since cyanobacteria first appeared when Earth had been wanting everything dead, or putting it less contentiously, Earth conditions tended towards everything in equilibrium.

370. In cyanobacteria which cannot fix nitrogen there is an ability that when nitrogen stocks are depleting to move to a dormant stage. The steps are a prolonged series of intricate, individual and integrated actions analogous to the stepped shutdown of a computer integrated manufacturing system which involves actions consequent on other actions. Resuscitation is equally intricate as metabolic pathways are re-integrated. Orchestration is mediated by RNA. No explanation exists how, from the very beginning, DNA code was present in an organism for a possible eventuality; one that might or might not happen; in short, the bacterium had prescience of a possible event, namely, deteriorating conditions for life, and coded for such eventuality.

371. Because evolutionary principles entirely reject purpose in mutation and natural selection, then, a fortiori, accidental chemical reactions are all that is left for the assembly of a hypothesised RNA molecule containing what cannot be described otherwise than as an exquisitely detailed provisional contingency plan for action if the cyanobacterium *foresees* or *senses* the possibility of death by starvation.

372. Cyanobacteria using internal machines to manufacture *carboxysomes* in a manner similar, but several orders of magnitude more complicated to that in which magnetotactic bacteria manufacture magnetic crystals from iron. Carboxysomes are polyhedron shaped, selectively permeable,

protein shells enclosing another protein, the enzyme *RuBisCo*.

373. *RuBisCo* is the predominant enzyme in carbon fixation or carbon assimilation**;** the conversion process of inorganic carbon dioxide to organic compounds. These compounds are then used to build body structures like cell walls and to produce energy as in ATP. RuBisCo is the most abundant protein on Earth.

374. RuBisCo is a *rate limiting* enzyme, an enzyme which determines the steps taken in reactions. Reactions learned in high school like $NO2 + CO \rightarrow NO + CO2$ do not occur in a single step and may involve a reverse step. The function of the carboxysome itself is to concentrate carbon dioxide with close proximity to RuBisCO, eliminating a competitive reaction with oxygen.

375. In a sense, a *carboxysome* is a sub-microscopic cell, or *microcompartment*, within a microscopic cell. The word *organelle* which might have been earlier used is being replaced by terms like *compartment*, increasingly being used to describe coherent structures within a cell that perform clearly defined sets of tasks such as chloroplasts, which do so by photosynthesis. These *compartments* add a further distress to explanations of first origin of life as being impossible to recognize as having been generated by fortuitous combinations of inert chemicals, thus being forced to use expressions like *exact evolutionary history remains uncertain* and postulating

theories of *capture* of some entity leading to an imprecise *endosymbiosis*.

376. Photosynthesis occurs in two stages. In the first stage, light-dependent reactions capture the energy of light and use this energy to make other energy as the energy-storage and transport molecules ATP and Nadph. The Calvin cycle uses the energy to convert carbon dioxide and water into organic compounds that can be used by the organism. These two steps make up *carbon fixation*.
Stated in this simple fashion does not reveal the intricacy of the reactions inside the carboxysome though this second stage chemical equation might;
$3\ CO_2 + 6\ \text{Nadph} + 6\ H^+ + 9\ \text{ATP} \rightarrow (\text{G3P}) + 6\ \text{Nadp}^+ + 9\ \text{ADP} + 3\ H_2O + 8\ P_i$
This type of activity, in itself, effectively destroys any conception of a protobiont.

377. The *carboxysome* has an outer shell composed of a few thousand protein subunits and small pores perforate the shell possibly serving as the route for diffusion of, for example, bicarbonate into and out of the carboxysome. The pores have positively charged amino acids in the pores reasonably hypothesised to assist diffusion of negatively charged products.

378. Photosynthesis begins when energy from light is absorbed. The photosynthetic reaction centre, an elaborate, multiple,

interconnected *molecular cluster* of different proteins, pigments and light absorbing molecules, assembles to execute the primary energy conversion reactions of photosynthesis.

379. An unanswered question is the origin of these *molecular clusters* containing chlorophyll and other light-capturing proteins. There are no known precursors. Neither is there accounting for the origin of more than 100 proteins with a corollary explanation of how they came to cooperate. There is no suggestion of an earlier system containing 5, 10, 30, 50, or 60 proteins.

380. The suggestion is commonly put that the bacteria borrowed photosynthetic capability from a possibly extinct lifeform. *Borrowing* from a *possibly extinct* life form is scarcely different to a just-so narrative of a pumpkin mutating into a carriage, mice became horses, and a grasshopper acquiring a human form as a coachman. The imagined possibly *extinct life form* still had to emerge from an earlier life form, or from a protobiont. There is no theory how a protobiont acquired the capacity for photosynthesis. The indisputable fact is that there is no known ancestor of cyanobacteria, and, tellingly, no coherent, agreed, theory of origin.

381. Efforts to explain the origin of the cyanobacteria draw analogies from the difficulty of explaining origins in the case of birds and mammals. What is tantamount to an embarrassing plea for patience and understanding is made asserting that, if

tracing an origin was difficult with birds, it is unknown order of magnitudes more problematic to trace a beginning with an ancient evolutionary relationship many times older, and microbial as well. Nevertheless, confident assertions are made of the presence of many useful clues.

382. Comparable to the sudden appearance of the universe, comparable to the sudden appearance of a stupendously intricate living cell, the sudden appearance of oxygenic photosynthesis demands a rational explanation if a super-natural force is to be denied. The production of a convincing exposition is frustrated by insisted requirements that any account must conclude by demonstrating an evolutionary past and a well-evidenced pathway to the present.

383. The natural sciences of physics and chemistry are sharply separated from evolutionary biology science. Physics and chemistry are first principle, non-historical sciences; evolutionary biology and associated geology and palaeontology sciences are *historical* sciences.

384. Evolutionary biology is a *historical* science compelled to proceed by reconstructing a set of contingent events. Inevitably, biology explains in retrospect what was not predicted; put differently, imagining what must have happened then constructing a best description of steps, and skip-steps to be accounted for later, that seem to fit

observations.

385. The hundreds of times that the word *surprisingly* occurs in scientific biology reports is a reflection of the non-predictive nature of evolutionary biology.

386. An evolutionary researcher is committed to an axiomatic proposition that, because a thing exists, and is much too complicated to appear originally in such a form, there needs must be an evolutionary explanation that earlier, less complicated, forms that need must have existed, and which gradually emerged over many hundreds of millions of years.

387. The discovery of the early appearance of cyanobacteria, so soon after life became possible, caused a serious retreat from the evolutionary proposition that oxygenic photosynthesis is a very complicated metabolism, taking billions of years of mutation and natural selection. It was replaced by a hypothesis that even extraordinarily complex metabolisms like photosynthesis may evolve rapidly. This versatility and malleability inevitably suggests that evolution is similar to a foxtrot in its timing; slow, slow, quick, quick, slow.

388. If the estimated or deduced time taken between one major biochemical development and the next is X years, then evolution proposes that X years is the time evolution needs must take for such a transition. In the case of

photosynthesis, the original estimate slipped from two thousand million years to three million, or 99.333% out, casting a doubt on the reliability of estimates from one major development to the next and the inherent and poor predictability of the theory.

389. The tentative nature of the reconstructions of the biochemical pathways that must, might, could, or should, have led from one stage to the next, to the next and the next and the next and the next has caused emergence of the exceedingly cautious character of some of those reconstructions and hence the real difficulty in calculating, much less specifying, the probabilities involved in any one step.

390. The sudden emergence of cyano-bacteria with no traceable forebears compels the response that here is some evidence of a super-natural cause for the origin of life, or, to put it another way, to say that life could be explained by unknown but sophisticated combinations of also unknown physical and chemical laws, is an indication of a brazen determination to stop the ears to any other argument but a material one, irrespective of evidence.

391. Join thumb to thumb, and middle finger to middle finger forming an "O". Close thumbs to fingers and, when joined tightly, pull apart. That is an inadequate demonstration of what a bacterial cell does in an astonishingly complicated process known as *binary fission.*

392. Summarizing a complex process, because the apparent simplicity at macro level masks outstanding intricacy at the micro/molecular level, the process of binary fission begins with the cell *lengthening* itself to adopt a tubular/spheroidal shape. *Lengthening* is a word used to summarise changing smoothly from one bodily form or shape another by small gradual steps.

393. Diverging momentarily; reductive materialism is unable to explain the basic form of *any* particular organism from bacteria to whales. Studies of macroscopic forms indicate that even a perfect description of the microscopic properties of a material is not enough to predict its macroscopic behavior. The more that biology, particularly embryology, is quantified the more conundrums arise. What is the reason for the rod shape in one bacterium and the spiral shape in another has not been ascertained so far by studies of the bacterium's DNA never mind the assembly of a proteasome or flagella or flagella cap. Why does one stem cell become a neuron, and another a muscle cell? And how? These are not only unanswered questions but elusive ones which may not yield an answer.

394. At this time, the DNA begins to replicate itself. *Replicating itself* probably involves more steps than there are in the Scala Sancta.

395. Replication done, the two copies of the original DNA move to opposite ends of the cell.

396. Next, the cell envelope forms a ring of units of protein around the equator of the stretched cell wall. A world of physical/chemical equations and details is compacted into the words *forms a ring*. In summary, a specialised protein, FitZ, is both architect and foreman directing the work.

397. The units of protein in the ring all in place, they trigger accumulation of other proteins which recruit wall and membrane units to now form TWO cell walls and membranes, a septum, from the outside of the tube to the inside. In the place of one bacterium there are now two bacteria.

398. Why does a bacterium divide? One reason is because it is growing. Its ideal size is 1 to 5 microns - 1 to 5 millionths of a metre. Once it begins to get larger, its surface area to volume ratio changes; making it difficult to diffuse molecules around, and in and out of, the cell.
How does it *know* when it is too large? This is still being investigated without result, and more to the point, what force, what DNA sequence, set that threshold? Obviously, the first living cell had to *know* when it had reached the too large limit

or it would die. In the first cell, inherited from the indescribable protobiont, were the limits of growth and messaging mechanisms.

399. Imagined protobionts needed messaging networks so that the first cell might have them. The only source for messaging networks in a protobiont are accidental associations of inert chemicals.

400. Proteins form unfathomably complex networks of chemical reactions that allow cells to communicate. Language is inadequate to describe this phenomenon but in the absence of a better description the network could be said to give the cell a form of cognition.

401. The component proteins of the network are too variable, the networks too large, interconnections too numerous variable and diverse to measure the full complexity of cellular networks.

402. Molecules of protein send out specific frequencies of electromagnetic waves which not only allow them to see and hear each other as both photon and phonon modes exist but become ineluctably drawn to each other if vibrating out of phase. Proteins with the same biological function share a single frequency peak while there is no significant peak in common for proteins that have different functions.

403. Photons emitted in bacterial cell can be counted and it would be past surprising if they are without purpose. The science involving photon emission is collected under the heading of *biophotonics* and has practical applications in medical imaging and is surpassing the use of optical tweezers in microbiology. Biophotons constitute another, and inexplicable, form of energy that is generated within the living prokaryotic cell and that moves through its living environment.

404. Biophotons defy explanations of accidental origin, or mutation, or natural selection.

405. *Microtubules*, as the name suggests are microscopic tubes. Bacterial microtubules are built from proteins that are closely related to the microtubule proteins in eukaryotes. It is currently hypothesised that if light is being used for messaging then travel inside the tubules which now act as wave guides and overcome the density of the cell impeding or preventing the signal from passing.

406. No estimate exists of the length of time that it might take for cellular networks to find the right mathematical configuration. Information exchange is greater than a comparatively simple assembly of protein parts. A message requires a sender, a medium of exchange and a receiver; all existing at the same moment, one has no function or purpose without the other. But overleaping the many possible variations implicit here, the question is raised how the sender of the message *knows* the

information being sent in the first place and how does the receiver *know* what to do with the message when it is received.

407. To the helpless reply that cellular networks *somehow* evolved over time it is legitimate to ask further; evolved from what? There is no evidence of a simple messaging system that could arise by chance.

408. It has never been shown that a coding system and semantic information could originate by itself through matter alone.

409. The information exchanges in cellular networks is parallel with that between bacteria when *quorum sensing.* Quorum sensing bacteria both export a messenger molecule and *sense* its concentration in the environment. They thereby *sense* their population density. When the concentration of the quorum-signalling messenger molecule becomes large enough for all of them to sense a quorum the bacteria then change their gene expression behavior, for example to turn on the production of virulence factors. When acting cooperatively, their most important communication is via messenger molecules whereas, when acting as separate cells, they exploit DNA transfer via conjugation.

410. The description of behavior in quorum sensing does not explain the cause of the behavior. That is unknown. The suggestion that it happened by accident is desperately fanciful, but in accord with the answer to all such questions, namely,

there must have been an earlier extinct organism that left no trace of itself.

411. The cell wall needs to grow; peptidoglycan precursors are *made*, they are *transported* across the cell and *transported* through the membrane, once out they *integrate* into the cell wall. It appears easy; the non-appearance of a living cell demonstrates that it is not.

412. The procedure and the complex machinery required for successful cell division, presents a fiendish unanswered challenge to a lucky-chance-mutation step-by-step approach of life's origin. As it stands it must be implied that, built into the very first molecules that constituted the first projected protobiont, was an extraordinarily long set of detailed, time-dependent instructions when and how to use the machinery is specified. In flight engineering terms, a MEL or minimum equipment list, was provided by inert chemistry, by chance; or so the only theory goes.

413. The cell structure of the earliest bacteria like cyanobacteria does not possess a membrane-bound nucleus, nor does it have mitochondria, Golgi apparatus, chloroplasts, and endoplasmic reticulum. These are organelles, part of cells which appeared two billion years later.

414. *Mitochondria* act like a digestive system which takes in nutrients, breaks them down, and creates energy rich molecules for the cell.

415. *Golgi apparatus* modifies, sorts, and bundles the big molecules like proteins and lipids as they are synthesised; comparable with a sort of busy working factory/warehouse and dispatch centre.

416. *Chloroplasts* are very similar to mitochondria, and like mitochondria, synthesise food for their cells, though using light.

417. *Endoplasmic Reticulum* is more commonly known by its initials, "ER." ER has multiple functions like folding or modifying proteins and then transporting them.

418. The bacterial cell membrane takes on all of these roles. In one sense, the cell membrane is a jack of all trades; in another

sense, the cell membrane IS the cell (barring the DNA). When these activities are collected they are referred to as respiration.

419. The earliest known life forms, then, when they first appeared on Earth, could strip hydrogen ions out of cell liquid, could carry out intricate complicated catabolic processes breaking down complex compounds to make energy. They could carry out anabolic processes whereby they built up complex molecules and complex molecular machines like the flagella. And it did these things through an efficient effort-saving system involving electrochemical processes principally involving sodium and hydrogen ions.

420. The earliest form of life, bacterium, did more – it reproduced itself. Through DNA

421. DNA is a macro-molecule, a molecule made up of other molecules. It is superficially shaped like a ladder but unlike a ladder, the rungs are not the same length or material. The rungs in DNA are alternately long and short, stronger and weaker. The superficiality of the analogy is exposed when it is considered that a more appropriate description of the DNA is that it is more like a chain of stacked individual molecules. The molecules themselves are not in symmetric shapes owing to the different angles of the bonds between sub-molecules and atoms. This analogy has the same limitations as the first, but ultimately the shape is similar to a thin coiled spring which

twists back over itself, twisting and writhing.

422. The why-that-shape question is complex but one answer resolves itself into an observation that if a macromolecule is to be constructed with particular components then the unit components are determinative in the shape's outcome.

423. This double ladder, antiparallel and complementary, with its meticulously placed bonds happens to suggest a new analogy. In this analogy, DNA is similar to a zip fastener which in turn makes it very efficient when the time arrives to duplicate the DNA as at such a time the structure is easily partially dismantled.

424. In the long run, DNA is a protein, the primary importance of which lies in what a protein does. DNA is something that does nothing. That is, it does no more than a twisted ticker tape does, no more than the assembly instructions of a flat-pack chair; does no more than a cook book. Up to a point.

425. DNA is a formatted database.

426. The critical characteristic any database must possess is the capacity to maintain the accuracy and consistency of *data* over its entire life-cycle. The integrity of the data in DNA is well-known and strongly established; continued existence of the data survives the death of the cell for centuries or millennia. Depending on the data involved, a failure of integrity could

manifest itself in anything from benign to catastrophic.

427. Maintenance of data integrity is inbuilt in DNA; if corruption of the data is detected it is attended to by a number of procedures; *proofreading*, which corrects errors during DNA replication, mismatch repair, which fixes mis-paired bases immediately after DNA replication, and DNA damage repair pathways, which detect and correct damage throughout the cell cycle

428. In *proofreading*, if an incorrectly paired nucleotide has been added, it will be removed and replaced with the correct nucleotide before continuing with DNA synthesis. In *mismatch* repair, mis-paired bases and small copy errors detected after replication are similarly removed and replaced.

429. Equivalent, or homologous, recombination is the principal method for repairing breaks. Each cell carries a duplicate set of DNA and the broken strand of DNA is brought to and perfectly aligned with the undamaged strand in the duplicate. This paired form is used to reconstruct and reconnect the strands. The error correction, like the others, is astonishing and marvellous examples of unintentional material physio-chemical reconfigurations improvement arising by pure chance mutations, in exactly the same way that does not happen when a line of code mutates, according to materialist origin of life canons.

430. Discovery has been made that the double-helix shape of DNA, complex as it is, is more complicated than thought, requiring considerable modification of biology textbooks. At spaces along the DNA are twisted knots better known as intercalated motif structure. They bear a stunning resemblance to a damping or boosting device in an electronic circuit, and, coupled with the knowledge that DNA can carry electric current, the unsolved problem of constructing or even designing a living cell in a laboratory has had a new horror added to the struggle.

431. The living cell has expanded to mean a chemical, mechanical, electrical, and biophotonic system. One may hypothesise one of the four possibly arising by chance or luck; that all four could arise at the same time as each depends on the other is a proposition more fitted to Alice in Wonderland.

432. The line of reasoning that since life has happened then it was originally possible that life would happen, must necessarily be understood in context with the reasoning that if life had an origin in earth-time then it needs must have the necessary time actually available. Chemical reactions take finite discrete steps in finite discrete time blocks. Even allowing chance availability of elements in the correct spatial dimensions there is insufficient time for such a protein molecule as DNA with its stable formatted data, and its manifold error corrections systems to materialise and be incorporated in the imagined protective protobiont which theoretically preceded the first

bacteria.

433. It is only magic that does not have time restraints.

434. ~~James Watson and Francis Crick reasoned the structure of DNA in part from the x-ray diffraction work of Rosalind Franklin and Maurice Wilkins. The central role DNA plays in the inheritance of traits and encoding the structures of proteins was established and there was common agreement that DNA is the fabric in which essential information is recorded about how the molecular machinery of an organism operates and how to build that organism.~~

435. ~~When Watson and Crick discovered the structure of DNA they also discovered that DNA stores information using a four character chemical alphabet. Strings of precisely sequenced chemicals, nucleotides, store the assembly instruction for building the crucial protein molecule the cell needed. It follows that building a living cell at the very beginning requires DNA.~~

~~Building proteins requires the genetic information stored in the DNA~~

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436. ~~Crick's conclusion that *DNA makes RNA makes protein* became the canonical basis, or paradigm, of the genetic transfer of information.~~

437. ~~This paradigm was wrong, and was only upset after the genetic code, or more accurately the genetic cipher contained in the DNA led the way to founding the discovery that stretches of DNA did not code for proteins.~~

438. ~~Demonstrating the inertial force of any paradigm, those stretches, or sequences. were caustically dismissed as *junk*; useless accumulated residue of evolution, miscopied fragments of mutated genes specified by evolution and persisting despite the improving effects of natural selection. An impressive group of distinguished scientists contributed to the making of the myth of *junk* DNA. Popular expounders of science conveyed an illusion of superiority as they waved hands and smiled condescendingly.~~

439. ~~After Francis Crick stated that junk DNA had little specificity and conveys little or no selective advantage to the organism the myth of junk DNA continued to grow in spite of research showing that *junk* DNA might have some functional activity. Other scientists were uneasy as they reflected on the constantly demonstrated parsimony of nature.~~

440. ~~Capsizing the paradigm of junk DNA are the discoveries that the major portion of DNA is, analogously, transcribed or~~

pruned into strands of RNA and that the strands have profound and lasting effects in development of the cell. In this view, the RNA contains algorithms for utilizing the plain data contained in the DNA.

441. If DNA is a formatted database stored on a computer's hard drive; RNA is the program.

442. This view challenges the paradigm of causality from gene to organism in that there is nothing in the gene itself, for example, which specifies self-assembly, stopping and starting, transport to specific destinations and folding by means of chaperones. These activities constitute epigenetic influence. The lack of a universal definition of *epigenetic* has produced significant ambiguity across biological fields; broadly, it entails an opinion that DNA is not everything when it comes to inheritance, development or bodily form.

443. Resistance to the challenge is increasingly buried by derisive commentary unworthy of scientists.

444. The resistance to the demolition of the paradigm is comparable to the resistance to the paradigm of the sudden emergence of the universe and, likely, for the same reason.

445. The paradigm of junk DNA is regarded as buttressing, short of proving beyond reasonable doubt, the theory of evolution by regarding the junk as litter from failed or superseded

~~innumerable small steps which are predicted and explicit in evolutionary theory.~~

446. ~~Simultaneously, the *junk* paradigm belittles counter approaches of theory weakness or theories of super-natural influence or causation.~~

447. ~~The din of battle over the role of DNA will eventually dissipate as resolution of the issue increases in clarity leaving the original question still to be addressed, namely the cause and original components of original living things.~~

448. There is no settled explanation how such formidably complex molecules as DNA and RNA emerged from chance encounters of chance selections of inanimate chemical elements. In particular, there is no coherent answer to questioning how DNA molecules could emerge from such containing, on first arrival, a cipher or representational symbol system of instructions for the manufacture of a myriad of self-assembling proteins containing selectable switching systems, error correcting systems, and complex motors and machines utilizing energy.

449. In place of reasonable explanations, the authoritative statement is that, technically, evolution had nought to do with the first appearances of DNA and RNA. Evolution only commences after reproduction and competition for resources has begun in

a cell.

450. Development of DNA and RNA, instead of originally arising evolutionarily from chance mutations and natural selection, theoretically arose as the result of laws of physics creating, through innumerable chances, a molecule which replicates. Inexplicably, this hypothesized first replicating molecule appeared in the relatively short time gap of four hundred million years between liquid water forming and life appearing; that is, between 4.3 billion years ago and 3.9 billion years ago. Paradoxically, as it was well over three billion years later that the unicellular and multicellular bacteria evolved into the phyla of the Cambrian Explosion.

451. The popular hypothesis, or speculation, is that, in some possible but indefinable tumultuous chemical soup, arbitrary chemical reactions will possibly occur without enzymatic assistance; RNA would be one of those compounds formed. RNA forms many self-complementary bonds, and thus possibly forms into structures with potential enzymatic activity.

This process of RNA forming via self-binding results into mostly useless tarry structures, but the occasional useful structure, preserved by some embryonic procedure of something somehow like natural selection, though categorically not the natural selection of evolution, is the idea behind the stages of pre-biotic development.

452. It is reasonable to say that there is a great shortage of convincing evidence to support this conjecture.

453. Wikipedia pleas to contribute a model for the prebiotic origin of the cell wall are unanswered.

454. A naturally occurring cell wall, forming and surviving by luck or chance in obedience to natural laws is the commonest segue into popular origin-of-life explanations. The soap-bubble-type image is a visually appealing example of a fortuitous unintended chance of a possibility as to how a bacterial cell wall perhaps might have developed.

455. No model for a working cell wall has been established, nor a real one constructed in any laboratory.

456. To close the gap between simple physical systems to something that can behave in a life-like manner and transmit information by material means, models skip the difficulty of the origin of the cell wall and instead concentrate on life arising in the absence of a cell wall.

457. These models resuscitate the abandoned theory that life arose spontaneously from nonlife; under a new name, *abiogenesis*, coined by Thomas Huxley in 1870 a decade after publication of the Origin of Species, and with new parameters. *[If] it were given me to look …to the … period when the earth was passing through physical and dynamical conditions…I should expect to*

be a witness of the evolution of living protoplasm from non-living matter. .. but ... I have no right to call my opinion anything but an act of philosophical faith. Later, in the Encyclopedia Britannica Huxley wrote, *Science has no means to form an opinion on the commencement of life; we can only make conjectures without any scientific value*.
That statement carries the same force today it carried then. No person claims to be *a witness of the evolution of living protoplasm from non-living matter* though rewards and honours wait on such a person.

458. The ancient theory that animals like maggots arose from non-living organic material such as rags and rotten meat was disproved in the 1600's and destroyed in the 1800's.

459. *Abiogenesis*, in over 150 years of effort, has not settled on any one model to explain the advance from physically inert non-living molecules to living organisms.

460. Abiogenesis models fork at the outset of the search for a model.

461. The left fork conjectures that life first arose when inert molecules, randomly associating, fortuitously became molecules with a power to repeatedly duplicate. In a vast number of accidental steps and re-duplications the molecules became more complex and acquired metabolic functions including an ability to construct a cell wall.

462. The right fork hypothesizes that life arose when lifeless molecules in an equally vast number of accidental steps acquired a power to use physical processes to turn food into energy, new growth, and waste products, then developed by chance the prodigious power to replicate.

463. Neither model has created anything resembling a living organism.

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464. Abiogenesis posits that the earliest known forms of life are too prodigiously complex to have originated unless there existed chemico/physical principles of molecular self-organisation combined with reaction enhancing catalysts; that there needs must be natural physical laws inexorably increasing complexity of matter from inert to living states, from molecules driven by laws to form protobionts, and thence to a living cell. The rationale for the hypotheses is that there is no other explanation conceivable absent the existence of such laws.
This postulation has not evolved into a testable equation.

465. The rationale is groundless if it is hypothesizing that a law can be a cause. It is useful to acknowledge that laws are conditioned by our process of discovery of a pattern in nature and that generally an observation precedes the formulation of the law and its equations. A law describes an existing phenomenon, it does not cause it. The Maxwell-Boltzmann

distribution *law*, is a description of the statistical distribution of the energies of the molecules of a classical gas, it did not cause the distribution. The postulation is analogous to claims that laws exist that cause nothing to materialise into something.

466. No imagined protobiont has been created, nor a proof-of-principle established.

467. Searches continue for some primordial informational polymers which could replicate genetic information, then store and release for copying. The sought for polymer is required to possess and exhibit the property of natural selection.

468. *Natural selection*, as widely understood, is a process that results in the adaptation of an organism to its environment by means of selectively reproducing changes in its hereditary potentials and limitations. It is one of the factors required for species evolution.

469. By analogy with species evolution, the principle of natural selection is hypothesised to apply to inert primordial polymers. Such analogies depend for their success on whether testable evidence has arisen from them.

470. This extension of natural selection to inert substances is free of any such testable evidence and the inescapable conclusion is

that *natural selection* has no place in describing how life may have arisen from inert life-less chemicals.

471. The *Theory of Everything* seeks to unite all known physical phenomena to explain the nature and behavior of all matter and energy in existence; basically, that there is one Law from which all other laws are derivable.

472. The paradigm of *evolution* has achieved such prominence that it is the Theory of Everything in life. It has extended from a theory of the origin of species to including all human-related knowledge including anthropology, art, culture, economics, history, labor relationships, politics, psychology, religion, and sociology. These other fields bear no relation to biological evolution and use of the word bears tribute to its elasticity in meaning.

473. A considerable effort has been spent over decades in attempts to define *life*; this effort is often biased by the focus of the definer.

474. Rather than define *life*, much scientific research looks at fundamental questions; what is the nature of the first macromolecules on prebiotic earth; what is the genesis of the first macromolecules after their nature is settled; how did these macromolecules self-assemble; how did genetic machinery evolve; how did the first macromolecules evolve to extract useful energy from the environment?

475. Not one of the questions posed has been settled. Each may be characterized as sharing a common belief that it is only a matter of time. Parallels are drawn and justifications made by comparing unsuccessful explanations of other phenomena in the past later corrected to the fact that life took billions of years to achieve its current form suggesting, without stating, that satisfactory explanations must appear in time. This explanation is immediately followed by agreement that mankind is halfway there and much useful information has been uncovered.

476. There is an increasing multiplicity of abiogenetic models and hypotheses such as RNA World, viral origins, iron–sulfur and zinc worlds, clay crystal, deep sea vent, deep-hot biosphere, extraterrestrial organic molecules, extraterrestrial life or reactive polyphosphates arrival on comets, lipid world, reductive citric acid cycles, multiple genesis and fluctuating hydrothermal pools; incorporating all or some of the above, to mention a non-exhaustive list.

477. The suggestion that life emerged first on another planet then earth was seeded is an alternative to the suggestion that amino acids formed on comets which stuck earth. The salient advantage of this *panspermia* is that it needs not face almost unimaginable probabilities to have occurred by chance association of non-biological chemistry. Panspermia postulates the existence of a satisfactory location somewhere in the

universe, without the need to locate it. It is difficult to dismiss the impression that there is some desperation here; triggered by the absence of any coherent natural/material origin of life and that, given the immensity of the universe, the hypothesis cannot be falsified.

478. The commonest given in local origin models of the origin of life postulates an early Earth environment with cyclic parameter variations of pH, salinity, luminosity, and warmth such as might have occurred in or near a hypothetical primordial ocean in an unknown specific atmosphere, now absent.

479. Essentially, abiogenesis proposes that one begins with a naturally occurring clumping of atoms which form nucleotides. The nucleotides in triple combinations produce amino acids. Amino acids are widely labelled as the 'building blocks' of life. These 'building blocks' then by *an accidental process* form small polymers which *might in some fashion* create larger complementary polymer strands that would then undergo cyclic dissociations and associations. The transition from small-sized molecules to larger polymers is *hysteretic*, that is; broadly speaking, no-going-back, or breaking down to original components, and, once it happened under suitable conditions, it would no longer be required to maintain the replication of complementary polymer strands.

480. This autocatalytic replication will, by itself, theoretically, accidentally give rise to those organic molecules which serve as monomer units, nucleotides, to short chains of fifty or less linked amino acid monomers, peptides, thence to longer chains, proteins.

481. A solution of monomers is questionable in formation of polymers because of the tremendous energy barrier in getting them to bond. Getting bonds to emerge in the absence of water cannot be achieved because there is no diffusion to allow the monomers to mix.

482. Under a generally accepted feature of plausible prebiotic conditions, the tendency is, for macromolecules which have overcome the barriers to break down and revert into the *building blocks*, rather than the reverse.

483. If conceded that *building blocks* were available, no model exists asserting inevitability for the blocks to actually cooperate in construction of a cell.

484. Each theory, barring extra-terrestrial life, provides no plausible probable goal-less naturally occurring physico-chemical pathway model from organic chemistry to living things; and the notoriously evasive complexity leap from organic chemistry to life defies attempts to spread it out over a succession of elementary chemical, electrical or physical interactions.

485. Simple models do not take into account the necessary starting complexity of any life; and more complex models must depart or stray from original ideas of simple, purposeless, non-focused, abiogenetic synthesis. The more complex the model, the further it defeats the naturalistic intent to represent life as the inevitable, predictable consequence of uncomplicated physics and chemistry.

486. The simplest living cell known has 500 genes with molecular machines that convert DNA to RNA and molecular machines that can read the RNA and synthesise, that is, manufacture, proteins. The molecular machines, like ribosomes, are utterly complex and of necessity were present in the first living cells.

487. Berkeley University promotes what can be described fairly as the plain man's guide to abiogenesis:
Simple organic molecules, nucleotides, might by some means have been synthesized in the atmosphere of early Earth and rained down in the oceans. The simple molecules, in the absence of light at nightfall, by some means formed more complicated molecules, broke apart in daylight and reformed at night until one molecule by some means probably did not break apart, and then by some means formed a template permitting accretion to create a longer more complex molecule. This molecule then by some means probably reproduced itself. Once a self-replicating molecule formed, some variants of these early replicators by some means would have done a better job of copying themselves than others, producing more offspring. These super-replicators by some

means would have become more common; that is, until one of them was by some means accidentally built in a way that allowed it to be a super-super-replicator; and then that variant would take over. Through this process of a lifeless molecule continuously invoking the principle of natural selection, rejecting and accepting improvements, a stable, efficient replicating system evolved. By some means a cell membrane either developed contemporaneously, or the lifeless molecule directed construction of a membrane which gave an advantage to the lifeless replicating molecule. Once inside a safe membrane, life was onwards and upwards.[7]

488. Another version is of the origin of life examines a serious contradiction often trivially called the *egg and chicken paradox* namely: genetic code has no function unless it is *translated*, *translated* here meaning that it leads to the synthesis of proteins whose structure is laid down by the code; but the ribosome machine that synthesises the protein consists of at least 50 macromolecular components which are themselves coded in the DNA. It other words it takes DNA to make DNA in the first place. How could two independent systems the DNA and the ribosome which rely on one another arise simultaneously? The question is rhetorical. DNA and proteins are so interdependent on each other for their existence that it is inconceivable to think that one type of molecule could have existed even temporarily without the other. It is an impossible-to-solve contradiction stated in those terms.
But this contradiction is resolved if the first organisms did not

require proteins for catalytic functions, that is, that something else took the place of proteins.

489. It might have been possible, the RNA World model postulated, for a genetic molecule with properties similar to RNA proteins to form spontaneously from chance associations of amino acids. In this world, barren of protein enzymes, all operative catalysts were ribozymes. Scientists speculate that ribozymes are remnants of an ancient world, long vanished, leaving no trace, that existed before the evolution of proteins. It is thought that RNAs used to catalyse functions such as cleavage, replication and RNA molecule assembly of amino acids or ligation.

490. The postulation extends now to simple microscopic spontaneously-forming bubble-shaped membranes which may have accidentally but simultaneously formed and one, in so forming, could have accidentally enveloped the fortuitously nearby self-reproducing molecule along with some water. This bubble would not dissipate under the aggressive ultra-violet light of the time if it was somehow shielded.
Simultaneously a complete microscopic machine, not made of protein but some other material and similar to a protein ion pump could have purposelessly developed simultaneously with both the molecule and the membrane and been trapped inside the bubble with them. The membrane now contains a self-reproducing molecule.
The membrane now must be replaced with another membrane which is many times more stable, will not evaporate, and with

numerous highly specific and specialised pores. It will not contain protein.

Now this protobiont would then copy itself without mutations until a sizable population could build up. Then mutations could begin and natural selection take place until improved versions of the numerous machines could be built. Having done so, it became extinct leaving no trace.

491. Such explanations for origin of life and the resolution of the paradox carry such enormous loads of cascading *if's* and evidence-free assumptions that a lecturer has been heard to complain publicly that students can answer all examination questions correctly but don't believe a word of it.

492. Deciphering the DNA code was a triumph, but it was only one of many codes present in the simplest cell.

493. In addition to the genetic code a number of new organic codes have come to light in recent years. Among them are the signal transduction codes, the histone code, the sugar code, the cytoskeleton codes, the transcriptional code, the tubulin code, the ubiquitin code, etcetera.

494. The living world is crowded with organic codes, in certain cases representing serious challenges to inorganic chemicals morphing into a living cell.

495. Life requires carbohydrates, lipids and proteins. The theory that chemists can demonstrate well understood pre-biotic

molecular mechanisms for their synthesis is without a foundation.

496. No evidence exists of a protobiont, nor intermediate step between non-living and living. No evidence of something part-way between a speck of chemicals and proto-life, much less an intermediate step between a motionless stone and a stone that dreams.

497. Elucidation of the origin of life is restricted by paradigm error analogous to the earth-centric paradigm of the physical universe.

498. The paradigm was created in Origin of Species: *Natural selection acts, as we have seen, exclusively by the presentation and accumulation of variations which are beneficial under the organic and inorganic conditions of life to which each creature is at each successive period exposed. The ultimate result will be that each creature will tend to become more and more improved in relation to its conditions of life. This improvement will, I think, inevitably lead to the gradual advancement of the organization of the greater number of living beings throughout the world;* and reformulated in the Modern Evolutionary Synthesis.

499. Darwin's theory described origin of species, not of life. The paradigm of onwards and upwards evolution of species, first seen in terms of a scientific law analogous to gravity which perpetually and indifferently altered existing organisms to create more and more complex organisms, was misconceived to apply to entities like government, law, psychology and economics until the paradigm reached its limit of utility when a fatal leap misapplied the paradigm to inert inorganic chemicals.

500. Contradicted by evidence of suddenly originating life simple enough to materialise but so exquisitely complicated to not;

naturalism relied and extended the paradigm, coupling it with unverifiable cosmological theories of causelessly existent eternal laws of physics, to postulate life's origin arising in innumerable discrete steps from inert elements to cooperating organic molecules driven onward and upward to an inevitable goal.

501. Naturalism incorporates an evolutionary paradigm of the origin of life as a fact, not because of evidence in its favour, but because it cannot admit that another explanation is possible without destroying a significant element of its footing.

502. Absence of evidence does not mean evidence of absence but when diligently sought and not found then absence of evidence of intermediate forms between chemicals and living bacteria, constitutes good reason to be skeptical of a postulation of natural processes coagulating inert chemicals into a living cell.

503. Science has failed to produce a testable verifiable and repeatable method for nature to produce the first living cell. There is still no plausible reproducible process for the first step. There is no agreement on what would constitute a first step.

504. One final proposition is that somewhere in the universe at some time over four billion years ago a race of super-intelligent life formed naturally through the same physical laws as life on earth, but in a different form to that on earth. These

creatures then brilliantly designed earth life forms, protoarchaea and protobacteria and seeded earth with them, then disappeared.

506. On the 13th of October 1988, in brazen ignorance, Edward Hall, head of the Oxford radiocarbon laboratory said, *There was a multi-million-pound business in making forgeries during the fourteenth century. Someone just got a bit of linen, faked it up and flogged it*!

507. In this shamelessly coarse and brashly unprofessional manner, Edward Hall created the myth that the Shroud of Turin was a fake.

508. The Oxford radiocarbon team had a mandate to examine a sample piece of linen cut from the Shroud, and by means of radiocarbon dating, *Accelerator Mass Spectrometry* technically, establish a range of dates for the origin of the fragment of linen they were provided with. They had no remit to examine the manner in which an image of a flogged and crucified man shows on the Shroud, nor did they attempt such; other competent and relevant scientists were so engaged.

509. In all, 32 scientists, professors, and skilled technicians took part in fields of
physics, infrared spectroscopy, infrared spectral measurements, scientific photography, scientific photography/image analysis, chemistry tape/sample/removal/analysis, logistics, microphotography, technical support, visible/ UV spectroscopy, thermography, general image analysis by the director of imaging on the Voyager, Viking, Mariner and Galileo projects, x-ray

fluorescence/image/analysis, x-ray radiography, documentation photography, biochemistry, medical/forensics, conservation, medical analysis, biophysics, and chemistry/archaeology.

510. Hall had taken no part in the actual testing of the Shroud by the Oxford team and it is not unfair to assume that he was reliving the pleasure he had experienced with his slight and relatively unimportant involvement in the Piltdown Man fraud. Hall had an undergraduate's role in the exposure of the fraud when he worked under the instruction of Professor Sir Wilfred Le Gros Clark, one of the three men credited with exposure of the hoax.

511. When he died in 2001, the *Guardian* repeated and disseminated the myth in Hall's obituary: *The exposure of the Piltdown Man fossils as a fraud, and the debunking of the myth that the Turin Shroud had wrapped the body of Christ after the Crucifixion, were two of the triumphs of the remarkable scientist and inventor, Professor ET "Teddy" Hall.* The same line was taken in *The Telegraph*.
Hall's contemptuous dismissal solidified as myth when *Wikipedia* repeated the falsehood by unjustifiably repeating what had appeared in the Guardian. *Unjustifiably* because in the Wikipedia entry of the Piltdown hoax itself no mention is made of Hall' triumph or exposure.

512. There were no *triumphs*; Hall's first so-called a triumph was a directed involvement of a technical nature, the second pure fiction. It was, however, a triumph to begin an enduring myth.

513. Not ten years later, in 1989, *Nature* published *Radiocarbon Dating of the Shroud of Turin*. The offensive, unjustifiable, and embarrassing outburst of Hall was not repeated and the Nature paper stated, as it should, that a sample piece of linen had been dated as 'mediaeval'. Hall was not a principal author though cited as one of 21 contributors. The entirety of his contribution was that of a mention in a short footnote relating to other work where, paradoxically as it turned out, Hall had stated, *The importance of careful selection and packaging of samples is emphasised*.

514. The radiocarbon testing had been one part of the scientific analysis of the Shroud and, theoretically, would form part of the scientific team's report. It was not to be; and prematurely releasing the full radiocarbon report with Hall's contemptuous comment inevitably meant that scant attention was paid to the actual findings of the scientific team. It is fair to say that the majority of the public are equally as ignorant of what was discovered as Hall was.

515. It was well for the reputation of Oxford that they did not repeat Hall's remark in the Nature article. Within 20 years, Christopher Ramsey, then head of the same Oxford Radiocarbon Accelerator Unit which Hall had supervised,

stated that there *was much evidence that ... suggests to many that the Shroud is older than the radiocarbon dates allow, and so further research is certainly needed. Only by doing this will people be able to arrive at a coherent history of the Shroud which takes into account and explains all of the available scientific and historical information.*

516. Within six months of Ramsey's statement, Robert Villarreal, head of the team of nine scientists at Los Alamos National Laboratory which had examined material from the carbon14 sampling region as part of the original team with Oxford, stated unequivocally that the age-dating process failed to recognise one of the first rules of analytical chemistry, namely, that any sample taken for characterization of an area must be representative of the whole. *Our analyses of the three thread samples taken from the Raes and C-14 sampling corner showed that this was not the case.*

517. There is nothing wrong with the principle of carbon 14 dating; it is the practice which was called into question. Here, a basic tenet of archaeological dating, one for which an undergraduate would be forcefully criticized if overlooked, went unconsidered by good scientists; *the part must be representative of the whole*.

518. The results of radiocarbon measurements of the linen of Shroud at Arizona, Oxford and Zurich yielded a calibrated calendar age range with at least 95% confidence for AD 1260

– 1390. Far too many well qualified scientists and historians raised objections to permit the radiocarbon dating to stand unchallenged.

519. Sixteen years later after Hall's outburst, in 2004, a U.S. government publication, the *Journal of Research of the National Institute of Standards and Technology*, published an important retrospective on carbon14 dating. Because the Shroud of Turin was such a famous example, much of the paper cited it.

520. The retrospective dismissed argument that radiocarbon laboratories had done anything wrong in dating the Shroud of Turin. It rejected dating theories of scorching effects or contamination caused by a bioplastic polymer.

521. The Journal paper reported that the original proposed sampling protocol required multiple samples from different locations on the cloth; this proposal had not been followed. Had multiple samples been taken, the chemical differences between the sample area and the rest of the Shroud would certainly have been obvious to the laboratories in 1988. The scientific team had a definite protocol of several separate areas which Oxford overruled for no proper reason.

522. The Journal also raised an important issue of faulty procedures that might have prevented a possible error from what appears to have been invisible reweaving at the site; namely, intruding

threads of a much more recent date than the Shroud. It also acknowledged that disguised mending was a credible viable explanation of the challenged date.

523. The following year, 2005, the secular peer-reviewed scientific journal, *Thermochimica Acta*, a publisher of original research contributions covering aspects of thermoanalytical and calorimetric methods and their application to chemistry, physics, biology and engineering, published a paper which severely, and in detail, challenged the results of the 1988 radiocarbon dating. There has been no peer-reviewed refutation of, or challenge to, the criticisms in the Thermochimica Acta paper.

524. Following publication of the Acta paper, the physical science editor of Nature commented in Nature's online edition. In a ho-hum-so-what tone he mentioned the myth; … *the sample used for radiocarbon-dating studies in 1988 - which suggested that the shroud was a medieval forgery - is quite different from the rest of the relic…*

What prompted parenthetical insertion and repetition of a claimed myth is unknown, because no such claim is made the original Nature paper. Speculation could begin with comparing the image description in the original paper, *a man who appears to have suffered whipping and crucifixion* with the editor's misleading description of a *ghostly image of a serene, bearded man.*

525. The Acta paper specified two distinctly different scientific empirical findings challenging the radiocarbon date. Firstly, that the area of the cloth from which the samples were taken was chemically unlike the rest of the cloth in several ways; secondly, cotton fibres had intruded into the sample. Both issues, independently, led to a conclusion that the samples were not representative of the cloth. Shortly, the radiocarbon dating had been established as worthless and irrelevant.

526. One of those chemical differences, the quantity of vanillin present on the shroud, provided a clue about the shroud's age. Samples from the main part of the cloth, unlike the carbon 14 sample area, contained no vanillin. If the Shroud was only as old as the radiocarbon date, it would have plentiful vanillin. The point is well taken, Nature agreed. Repair patches on the Shroud have clear provenance and abundant vanillin; the Shroud did not, leading to the conclusion that the Shroud was much older than the patches sewn onto the shroud in 1552.

527. If the shroud linen had been manufactured in mediaeval times, it should have retained at least about 37% of its vanillin. The Nature commentary noted, *let's call it somewhere around the middle of that range, which puts the age at about 2,000 years. Which can mean only one thing*… The terminating ellipsis appears in Nature article.

528. It meant more than *only one thing*, it signified that another considerable commentator, this time the serious 'Nature,' had

joined scientists disputing the radiocarbon date, and that the date exactly corresponded with the date of Christ's execution.

529. Whether or not vanillin content is an accurate method for determining the age of linen, depending on variables like storage temperature, this information verified that the radiocarbon sample is chemically different from the rest of Shroud. It demonstrated that the tested sample contained newer material than the remainder of the Shroud with foreseeable attendant unreliability.

530. The Acta paper also mentioned that the sample area used in radiocarbon dating had intrusions of cotton fibres. Whether they were there as a result of invisible mending or not, they were evidence that the samples were not representative of the whole. The remainder of the Shroud has no cotton fibres.

531. The Acta and the National Standards paper are, effectively, capstones on earlier evidence and criticisms that the radiocarbon dating could not be trusted because the sample could not be trusted.

532. Eight years later, in 2013, it was reported by Giulio Fanti and Pierandrea Malfi that a new method of dating ancient fabrics based on the tensile strength of the threads, had dated the shroud to the epoch of Christ contradicting the carbon dating. Later checking in 2015 by the same authors, with the addition

of Dr. Basso, confirmed the epoch.

533. Earlier concerns of dating reliability stemmed from ultraviolet and x-ray photographs taken in 1978, before the carbon 14 dating samples were removed. These indicated that there were chemical differences between the sample area and surrounding areas of the cloth. A significant quantity of aluminum in yarn segments from the general area of the sample had been detected in the sample area though not on other samples from elsewhere on the Shroud. Alum, an aluminum compound, is a common dye fixative. Combined with the later discovery of Madder root dye it provided an explanation for dating non-coherent with historical and botanical evidence.

534. Giovanni Riggi, the person who had actually cut the carbon 14 sample from the Shroud stated, *I was authorized to cut approximately 8 square centimetres of cloth from the Shroud…This was then reduced to about 7 cm because fibres of other origins had become mixed up with the original fabric.*

535. Riggi's statement was confirmed by Giorgio Tessiore, who had officially documented the sampling, wrote: *…1 cm of the new sample had to be discarded because of the presence of different colour threads.*

536. Gilbert Raes, an acknowledged textile expert, who later examined some of the carbon14 samples, noticed that cotton fibres were contained inside the threads, which could help to

explain differences in fibre diameter. This may also explain why the carbon 14 samples apparently weighed much more than was as expected.

537. The incontrovertible and total destruction of Hall's contemptuous trashing of the Shroud as a 'fake' does not necessarily mean that the date is wrong; it most likely is very wrong, but at minimum, it entails that radiocarbon testing needs to be done again; this time properly.

538. Dating of the linen is a diversion, in some ways though powerful evidence of authenticity. If the image appeared today on a sheet in a motel in New York the question would still remain how the image appeared there. Whatever new date is agreed on for the age of the Shroud, the appearance of a flawless image of a dead crucified man on a length of linen is un-natural; as un-natural as a causeless appearance of the universe. It is as un-natural as a causeless appearance of first life. All three need to be explained in terms of cause.

539. It is naïve to think that answers to these three origin questions have no consequences. The first two carry implications for the existence of a super-natural world, that is, a world indifferent to natural laws. The third answer relates not only to a super-natural world but whether Christ was of this super-natural world.

540. The barrier to existence of a super-natural world is expressed in the naturalist credo that nothing happens without a cause. If everything has a natural cause, all is well for naturalism; if anything can be established to have no natural cause, the reverse applies.

541. The origins of the universe and life, clearly occurred at a point when there could be no human observation. It is necessary to use modern concepts of probabilistic causation and causal processes to reach, within agreed limits, a causal explanation.

542. Faithful replication is impossible regarding the universe, it is not so with the image on the shroud. If replication can be naturally achieved it is powerful evidence of a possible natural cause.

543. It is impossible to re-create or reproduce the universe in a laboratory, but it is, if the natural credo holds, possible to re-create first life. Research with that aim is old, widespread, consistent, well-resourced, persistent and unsuccessful. It is no overstatement to say that a place in history books, a Nobel prize, wealth and dozens of honours will follow success in this endeavor. It is also no overstatement to say that such inducements have borne no fruit.

544. Similarly, replication of all the characteristics of the image on the Shroud would explain a natural cause for its appearance. In order to be a faithful re-creation, it is a proper thought to

examine the Shroud in general and its image in particular.

545. The linen of the shroud is composed of threads, the threads in turn are constituted by fibres. The image is extremely superficial, lying on the uppermost surface of the fibres of the threads. The color does not penetrate the fibre, it is surface only. The color has not soaked in.

546. The inner fibres of each thread are not coloured, though the surface is.

547. No paint pigments or paint-carrying mediums is found bound or adhering to image-bearing linen fibres.

548. The colour on the fibres is caused by something similar to the Maillard chemical reaction that causes white bread to turn tan coloured when toasted.

549. There is no evidence of a coating or extraneous material added to the fibres to cause the image colour.

550. Testing the image, including use of laser-microprobe Raman spectroscopy, pyrolysis-mass-spectrometry and micro chemicals, showed that:

a. The Shroud itself does carry paint debris. Artists made copies of the Shroud and the copies historically were laid on top of the Shroud to *authenticate* them as true copies, unavoidably leaving scattered indiscriminate traces of paint

fragments. *Authentication,* in this instance, is the process of making a third-class *relic*, expressed differently; something that has touched a first or second-class *relic*.

b. Iron oxide is commonly found in paint mediums, and iron oxide is evenly distributed over the entire cloth in both image and non-image areas, except in bloodstained where it is naturally highly concentrated. Apart from the bloodstains, the iron oxide presence originates in the practice of soaking linen flax in water as part of *retting*. When linen is retted, flax plants are laid in a body of water for a lengthy period. During this time calcium, strontium and iron are absorbed by the linen fibrils. Calcium, strontium and iron were the only inorganic elements found on the Shroud.

c. There are no signs of adherence or clumping between either the individual linen fibres or the linen threads. There is no sign of any capillary flow through the fibres and threads and no signs of capillary flow associated with any tacky or sticky paint nor other artistic medium.

d. There are numerous bloodstains on the Shroud corresponding to different flow directions and these do show cementation of fibres, and capillary flow.

e. Many blood flows are consistent with a vertical, crucifixion, position. There are other postmortem blood flows consistent with the horizontal burial of a corpse.

f. The red stains are those of human blood, and serum rings generally surround the bloodstains.

g. When illuminated by ultraviolet light the image displays marks not visible otherwise. These marks are such as dumbbell

shaped scourge marks and wounds associated with the body image, consistent with what would be expected from scourging live human flesh.

h. There is no yellow-brown coloration nor images underneath the bloodstains.

i. In the area of the bloodstains and in some areas associated with water stains, there is clear and well-documented evidence of cementation between fibers, as well as evidence of capillary flow of liquid.

551. The shroud images viewed directly in natural light have the tones of light and dark reversed to that normally experienced in human visual perception. When viewing a negative photograph of the Shroud, the image details are dramatically easier to perceive. This difference of being able to perceive much greater detail when the light and dark areas of the Shroud mages are reversed is the source of the *negativity effect* of the Shroud image.

552. The image has a resolution as good as 5cm with no well-defined outlines or borders. The image details such as the nose, lips, and beard are clearly defined, but the image on the Shroud seems to disappear if observed at a distance closer than one metre. Attempts to copy the image by manually painting a copy are foredoomed by the fact that the image seems to disappear when standing as close as a metre or less as a normal artist would.

553. The image-density distribution of both front and back images can be correlated to the distance between an object having the shape and contours of a human body and a cloth covering that body. This is why many reports state that the Shroud is a 3-dimensional image.

554. Image distortions of the hands, calves and torso are consistent with those which would be obtained if a body were lying on its back.

555. Mapping of image features from the body to the cloth of the frontal image is more or less vertical, corresponding to the direction of gravity.

556. The only major discoloration on the Shroud between the face area and the back of the head is an ancient water stain.

557. There are no evident signs of putrefaction to be expected with the decomposition of a human body, neither are there normal fluid stains.

558. The above characteristics of the image understood, numerous attempts have been made to reproduce the image naturally. Without exception, all have failed.

559. Direct imprint of a human body is the earliest explanation and was detailed in *Scientific American* when that publication had an authority and prudence now diminished. The theory

perished on the issue of lack of distortion in the image. Nevertheless, the article, by Professor Vignon, is a sober, easily read, description from the vantage point of serious biologist and philosopher as he was.

560. The diffusion or vapor hypothesis caused by the fermentation of urea creating a vapor reacting with aloes spread on the corpse was the next in time to be discarded, most obviously on the point that such was incompatible with the fact that the image is only on the uppermost surface of the fibres.

561. A variation utilizing the Maillard chemical reaction between amines generated by a decomposing body and a thin starch layer on the threads of the Shroud was abandoned with the discovery that there is no or insufficient starch present and absence of evidence of reaction other than on the surface.

562. The painted hypothesis was the basis of Hall's sneering remarks that generated the *fake* pronouncement. It originated with the finding that iron oxide was present on sticky tape samples taken of the Shroud, plus paint debris. The hypothesis was made in ignorance of the fact that iron oxide is present over the entire Shroud caused by the retting process. And in ignorance of the historically verified fact that painted copies were laid on the Shroud to authenticate. No artist has copied on linen without penetration of the pain medium beyond the surface layer.

563. A respectable and passable first glance result of the head was obtained by using powdered pigments to paint an image on paper. The image was then transferred to linen by burnishing then fixed with heat. It failed to reproduce a great many of the actual characteristics of the Shroud face image.

564. A variation of the bas-relief method obtained by heating a metal sculpture of a human face then impressing on a piece of linen failed to reproduce a great many of the actual characteristics of the Shroud image.

565. An ingenious hypothesis partly motivated by studying previous attempts to reproduce or explain the image, recognized that the image had many of the characteristics of a photographic negative. From this observation a camera obscura was utilized to obtain and project an image onto linen treated with silver nitrate to render it photosensitive. Historically the method was extremely doubtful and although the image was superficially very good, it fatally failed to reproduce many characteristics.

566. The “shadow” hypothesis based on the quality of sunlight to bleach was another thoughtful attempt to reproduce the Shroud image. It involved using sunlight and painted glass to cast a shadow onto treated, coloured, linen. The result was compelling to view, but unable to overcome unsurmountable inconsistencies with the original.

567. A well-funded team of university researchers commendably produced the best effort at reproducing the image using a mix of frottage, direct painting and heating in a specially prepared oven. The effort produced impressive results that included a fuzzy pseudo negative image residing on the top fibres of the cloth but none of the characteristic microscopic features. Also it included painted blood done in ignorance of the fact that the blood on the Shroud is real human blood. The research carried out essentially discounted all image-producing theories known up to that date.

568. Since 2008 no serious attempt has been made to reproduce the Shroud image and the field is open to largely untestable theories to explain the image formation. The theories involve radiation of energy, or coronal discharge, or neutron flux. Essentially, the search is for the *best fit* theory to explain the image while recognizing that for practical purposes the theory cannot be validated and that this is a once-only occurrence.

569. It is incontrovertible that the Shroud depicts front and back images of an adult male of average height and weight. Nor is any contest made that he had sustained severe injuries and that his cause of death was asphyxiation with evidence that this was caused through having sustained a nailed crucifixion. Forensic examination has identified features indicating rigor mortis in thighs and thumbs, buttocks and torso. This displayed rigor is commonly missed by painters.

570. The man in the Shroud appears to have swollen cheeks and his nose, bruised and swollen, has a deviation suggesting the cartilage of the nose has been separated from the bone. The areas around the eyes are swollen, there are wounds which have caused numerous blood flows and the impression is of a beaten face. The scalp has many more blood flows and puncture marks and wounds.

571. The wounds to the face and head are consonant with the accounts of Mark, Luke, John and Matthew in the Bible. In Luke, it states, *And the men who held Jesus mocked him and smote him* and they *struck him on the face*. In Mark, *then some…struck him with their fists … the guards took him and beat him*. In Mark, *twisted together a crown of thorns and set it on him* and they *struck him on the head with a staff*. Matthew and John give similar accounts.

572. Both forearms show blood flows originating in the wrists towards the elbows the expected directions to be taken if a man is crucified as the wrists are higher in that position. Had the arms been hanging by his side there would have been no blood flow except over the palm.

573. That the man in the shroud had been crucified is borne once again by short statements of the same writers. Corroborative evidence is the fact that crucifixion is well testified in Roman executions.

574. On the right side of the man's chest a large wound is seen, it has no swelling around it and the blood flow is not consistent with a pumping heart, indicating that the wound was inflicted after death. The wound has the appearance of being inflicted with a leaf shaped spear and John recounts this: *Instead, one of the soldiers pierced Jesus' side with a spear, bringing a sudden flow of blood and water.*

575. The back of the man in the shroud is covered in whip or scourge marks. The marks are recognizable as those to be expected from the use of a standard Roman flagrum of the era, particularly from the lead dumbbell-shaped terminals of the thongs. There are over 100 of them and forensic analysis indicates they were inflicted by two men, one on each side. The scourging is tersely mentioned by John, *Then Pilate took Jesus and had him flogged* and Mark, *He had Jesus flogged* and Matthew, But *he had Jesus flogged.* The marks are not visible under ordinary light.

576. On the shroud itself are two particular artifacts, pollen and dust. The vast majority of the pollen grains are those from the Jerusalem area, several found in that area only and the dust is relatively rare travertine aragonite limestone. The spectra of

samples taken from the Shroud has been compared with samples of limestone from ancient Jerusalem tombs and established as identical with it.

577. The linen of the shroud is of a weave pattern known in the first century and earlier and, though samples of linen from those areas match one another, samples of linen from later years do not.

578. The linen, the pollen and dust, the wounds, the blood, are important evidence of the identity of the man in the shroud, but they are only tangential evidence of the origin of the image.

579. There is no natural explanation for the image. No known laws of physics or chemistry account for it. In the absence of a natural explanation the issue of whether it could be an artefact of human intervention has been strenuously undertaken without success.

580. The image on the Shroud is consonant with the origin of the universe and the origin of life – that is, a once-only unreproducible event.

581. Life that springs fully armed from microscopic particles of otherwise unrelated chemical elements, a universe emergent from nothing, an inexplicable image on a linen cloth are strong if not irrefutable evidence of the existence of a super-natural world. There has been no refutation of the evidence.

582. The universe should not exist. Multiple inconsistent rationales and explanations are proposed for the disproportionate quantities of matter and antimatter that comprise the universe created during the big bang or, put differently, observations are inconsistent with known laws.

583. Life should not exist. This much is known from chemistry. In contrast to the ubiquity of life on earth, the lifelessness of other planets makes far better chemical sense.

584. The image on the shroud should not exist. Leaving to one side the obvious relationship with Christ and, in turn, relationship with God, the image is inexplicable.

585. To these three issues the response from science is to admit ignorance as though confessing it was a virtue, to maintain that time will answer the question, to point out that there were many unknown things that have yielded to human intelligence, that it is better to travel hopefully, and to be resolute in refusing to accept any possible evidence of a super-natural world.

586.

588. Intel in 2015 an alternative analytic method for estimating the age of historic linen fabrics was proposed. Following that testing a new date of 372 A.D. plus or -400 years was calculated. This was in certain aspects has opened criticism as the first attempt dating. One particular area of concern being the near impossibility of knowing the environmental conditions in which any historical piece of cloth has been kept. R. Basso, G. Fanti and P. Malfi, "A new cyclic -loads machine for the measurement of mechanical parameters of single flax fibers coming from the Turin Shroud for dating purposes"

589. In respect of the Shroud itself significant research supports the conclusion that the sample area tested was not representative of the entire Shroud.

590. In 2008, the ox for the Berkeley which had made the first carbon testing of the Shroud made the following statement "with the radiocarbon measurements and with all of the other evidence which we have about the Shroud the dollars seem to be a conflict in the interpretation of the different evidence. And for that reason I think that everyone who has worked in this area, the radiocarbon scientists and all the other experts, need to have a critical look at the evidence that they have come up with in order for us to try to work out some kind of coherent story that fits and tells the truth of the history of this intriguing cloth. Oxford Laboratoryarre

591. The Paradox of the "Ancient" (250 Million Year Old) Bacterium Which Contains "Modern" Protein-Coding Genes: "Almost without exception, bacteria isolated from ancient material have proven to closely resemble modern bacteria at both morphological and molecular levels." Heather Maughan*, C. William Birky Jr., Wayne L. Nicholson, William D. Rosenzweig§ and Russell H. Vreeland ; http://mbe.oxfordjournals.org/...../19/9/1637
592. Either way, it seems apparent that bacterial flagella were present in the LUCA, since Firmicutes are flagellated and Chloroflexi clearly encode flagellar genes
593. I clearly wrote in Darwin's Black Box that even if the individual parts had their own functions, that still does not account for the irreducible complexity of the system. In fact, it would most likely exacerbate the problem, as I stated when considering whether parts lying around a garage could be used to make a mousetrap without intelligent intervention. Even if there are relevant parts that if they were to be properly organised and interfaced would work, the problem is that without foresight, there is utterly unlikely to be a compatibility. Wrong size, wrong orientation of interface points etc etc.
594. Then,. That is maximally unlikely by chance and forces of necessity without foresighted direction. Assembly, interfacing, tuning and setting up — fine tuning in short — are hard to do.
595. Well lastyearon, let's look at the most famous example of cooption; The T3SS:

596. Genetic Entropy Refutation of Nick Matzke's TTSS (type III secretion system) to Flagellum Evolutionary Narrative:
Excerpt: Comparative genomic analysis show that flagellar genes have been differentially lost in endosymbiotic bacteria of insects. Only proteins involved in protein export within the flagella assembly pathway (type III secretion system and the basal-body) have been kept…
http://mbe.oxfordjournals.org/.....t/msn153v1

597. Phylogenetic Analyses of the Constituents of Type III Protein Secretion Systems
Excerpt: We suggest that the flagellar apparatus was the evolutionary precursor of Type III protein secretion systems.
http://www.horizonpress.com/jmmb/v2/v2n2/02.pdf

598. "One fact in favour of the flagellum-first view is that bacteria would have needed propulsion before they needed T3SSs, which are used to attack cells that evolved later than bacteria. Also, flagella are found in a more diverse range of bacterial species than T3SSs. 'The most parsimonious explanation is that the T3SS arose later," Howard Ochman – Biochemist – New Scientist (Feb 16, 2008)

599. So lastyearon the 'unfalsified' principle of genetic entropy shot down the 'just so cooption story' that you find so compelling, not to mention that you are simply incredulous that we would not see how reasonable your position is!!!

600. Yet lastyearon despite your disbelief at why we can't see 'how simple evolution is', the whole point is that Genetic Entropy IS THE RULE for all beneficial biological adaptions!!! Darwinian evolution certainly IS NOT!!!!, There is not even

one exception to this 'rule' of genetic entropy i.e. there are no examples whatsoever of the generation of complexity greater than what was already present in life, there are only examples of loss or 'adjustments' of function:

601. "The First Rule of Adaptive Evolution": Break or blunt any functional coded element whose loss would yield a net fitness gain – Michael Behe – December 2010
Excerpt: In its most recent issue The Quarterly Review of Biology has published a review by myself of laboratory evolution experiments of microbes going back four decades.,,, The gist of the paper is that so far the overwhelming number of adaptive (that is, helpful) mutations seen in laboratory evolution experiments are either loss or modification of function. Of course we had already known that the great majority of mutations that have a visible effect on an organism are deleterious. Now, surprisingly, it seems that even the great majority of helpful mutations degrade the genome to a greater or lesser extent.,,, I dub it "The First Rule of Adaptive Evolution": Break or blunt any functional coded element whose loss would yield a net fitness gain.(that is a net 'fitness gain' within a 'stressed' environment i.e. remove the stress from the environment and the parent strain is always more 'fit')
http://behe.uncommondescent.co.....evolution/

602. Michael Behe talks about the preceding paper on this podcast:

603. Michael Behe: Challenging Darwin, One Peer-Reviewed Paper at a Time – December 2010
http://intelligentdesign.podom.....3_46-08_00

604. Evolution Vs Genetic Entropy – Andy McIntosh – video
http://www.metacafe.com/watch/4028086

605. A timing monomer is a component the flagellum cannot be without as it makes no sense to assemble the flagellin units before the hook-basal-body has been constructed.
606. C1: Availaboratoryility. Among the parts available for recruitment to form the flagellum, there would need to be ones capable of performing the highly specialized tasks of paddle, rotor, and motor, even though all of these items serve some other function or no function.
607. C2: Synchronization. The availaboratoryility of these parts would have to be synchronized so that at some point, either individually or in combination, they are all available at the same time.
608. C3: Localization. The selected parts must all be made available at the same 'construction site,' perhaps not simultaneously but certainly at the time they are needed.
609. C4: Coordination. The parts must be coordinated in just the right way: even if all of the parts of a flagellum are available at the right time, it is clear that the majority of ways of assembling them will be non-functional or irrelevant.
610. C5: Interface compatibility. The parts must be mutually compatible, that is, 'well-matched' and capable of properly 'interacting': even if a paddle, rotor, and motor are put together in the right order, they also need to interface correctly.

611. The entire flagella assembly is about a millionth the size of a grain of sand, is a molecular machine, and may be compared with a sophisticated electrically powered outboard motor So too would be an electric drill with a short length of a whip sitting in the chuck.
612. It is one of three proteinic motors in prokaryote cells which have been unambiguously identified as rotary engines.
613. The motor has the parts of a generic motor – rotor, stator, drive shaft and the usual rings and bushes - even a clutch. It is a self-assembling, self-repairing, water-cooled rotary engine with two gears forward and reverse, able to reach between 6,000 and 17,000 rpm when disengaged. With a short-term memory; it is a multipart, tightly integrated, functional, system. There is nothing simple about it.
614. The motor is made entirely of protein, folded in different shapes, and is located at an anchor point on the inner cell membrane. The engine is powered by either a proton pump of hydrogen ions or a sodium ion pump - a flow across the bacterial cell membrane due to a concentration gradient set up by the cell's metabolism. The rotor transports protons across the membrane, and is turned in the process.
615. Those bacteria which want to settle in one spot can simply disengage the flagella by operating a clutch, but the signaling mechanism for starting and stopping clutching and de-clutching is opaque.
616. In fact, it is not known, nor are there any significant proto-models suggesting what force compels molecules to co-operate in a single celled prokaryote; transporting, assembling,

manufacturing amino acids, folding proteins, protein degradation and the numerous other actions of respiration.

617. Parsimonious. Parsimonious means the simplest model/theory with the least assumptions and variables but with greatest explanatory power. One of the principles of reasoning used in science as well as philosophy is the principle of parsimony or Occam's razor.

618. The flagella receive feedback from the environment by virtue of an elegant transduction circuit and can adjust their course in response.

619. Some have the capacity when stuck in a tight area to wrap the flagella round themselves producing a corkscrew appearance. The bacterium then twists its way out. This response by the flagella has no explanation; there is no pathway which can be suggested by natural selection.

620. In Ancient times up until now it was considered that there are things which cannot be known, the composition of the sun and planets, the nature of magnetism, the impossibility of heavier than air flight, but it was not until The Origin of Species that there slowly developed the stock reply when faced with difficulty of explaining anomalies that given enough time the answer will be found.

621. This belief is founded on nothing but faith in the theory of evolution it MUST be true, that evolution is true, and the fact that it has clearly moved from slow relentless progress to punctuated equilibrium ony means that details have been

changed. This is no detail. Punctuated equilibrium carried with it the common sense unanswerable objection that if it is true then the slow relentless progress paradigm cannot be true

622. Off the top of my head, experts have determined that it is forensically accurate down to the smallest detail. Even the blood samples have the presence of biluribin, which is a hormone produced in the blood when someone is tortured. Anatomically, it perfectly matches up with the Sudarium of Oviedo, and leading botanists have traced the pollen on the Shroud of plants that only grow in the Jerusalem area in the Spring.

623. The victim on the Shroud has wounds that perfectly match the injuries inflicted on Jesus as recorded in the gospels (and keep in mind that Jesus was a unique crucifixion). The vast majority of crucified people did not experience all the things that Jesus experienced in the gospels.

624. Furthermore, the image (created by the resurrection event) is on top of the blood stains, and even the the Italian chemist who was paid by the atheist organization to duplicate the Shroud of Turin was confounded by this detail. Then there is the rather unusual fact that the Shroud contains 3 dimensional information and the image shows up in the photographic negative.

625. *said team-member Dr Sean Crowe from the University of British Columbia, Canada.* (Pretty good eh. Because it took so

long that was proof of Darwinism proceeding in teeny steps. Because it now happened quickly that is proof that Darwinism has the ability to act quickly. Like a bloody foxtrot – slow slow quick quick slow

626. Https://www.insidescience.org/news/mystery-microorganism-may-have-been-first-produce-oxygen full comment needed here.

627. See https://uncommondescent.com/intelligent-design/new-study-oxygenic-photosynthesis-goes-back-three-billion-years/ for a cynica backflip from a previous paradigm and good description of the complexity.

628. The video above shows the process by which bacterial cells reproduce themselves. Looks simple, doesn't it? It's only a colony of cells elongating before splitting in two. Don't be fooled — appearances can be deceiving. As is so common throughout biology, the apparent simplicity at the macro level masks remarkable complexity at the micro or molecular level. In eukaryotes, cell division occurs by either meiosis (sex cells) or mitosis (somatic cells). Bacteria, however, undergo neither of those processes (they are asexual and contain no membrane-enclosed organelles or nuclei). Bacterial cell division occurs by a process known as binary fission. Rod-shaped bacteria (e.g. *Escherichia coli* or *Salmonella typhimurium*) elongate to twice their original length. This is followed by invagination of the cell membrane, and the formation of a septal ring in the middle (Vicente *et al*., 2006; Weiss, 2004). The elongated bacterial cell splits down the middle, forming two daughter cells. Some bacteria exhibit variations on this mechanism. For

example, in *Caulobacter*, no septum is formed (Poindexter and Hagenzieker, 1981) and its division is asymmetrical (Judd *et al*., 2003).

FtsZ Ring Assembly

A family of proteins called Fts proteins are necessary for proper cell division. One of these proteins, FtsZ, is key to cell division and is found ubiquitously in almost all known prokaryotes (Erickson *et al*., 2010; Margolin, 2005; Romberg and Levin, 2003; Erickson, 1997). There are a few notable exceptions to this generalization, including certain species of the genus *Mycoplasma*, (Lluch-Senar *et al*., 2010; Alarcon *et al*., 2007), *Ureaplasma urealyticum* (Vaughan *et al*., 2004; Brown and Rockey 2000; Glass *et al*., 2000), and the gammaproteobacterial clam symbiont *Calyptogena okutanii* (Kuwahara *et al*., 2007).

Cells with mutated FtsZ proteins are unable to divide; instead, they yield long filamentous cells (Addinall *et al*., 1996; Pla *et al*., 1991). In fact, for this reason FtsZ is a target for antibiotics (Schaffner-Barbero *et al*., 2012; Ma and Ma, 2012; Margalit *et al*., 2004). Togther, the Fts proteins build an apparatus for cell division called a divisome (Lutkenhaus *et al*., 2012; Gamba *et al*., 2009; Aarsman *et al*., 2005).

FtsZ is believed to be homologous to tubulin, but this is based largely on structural similarity, since the sequence identity is relatively weak (less than 20% overall). The sequence identity is strongest over the N-terminal GTP-binding domains but is almost completely absent over the C-terminal domains.

The first stage in formation of the divisome is the

polymerization of thousands of FtsZ molecules to form a ring, the so-called FtsZ ring (Fu *et al*., 2010; Adams and Errington, 2009; Stricker *et al*., 2002). Two additional proteins that are recruited independently of each other, called ZipA and FtsA, function to tether the FtsZ ring to the inner membrane (Huang *et al*., 2013; Pichoff and Lutkenhaus, 2002; Erickson, 2001). FtsZ ring assembly occurs provided that at least one of those two proteins is present (Pichoff and Lutkenhaus, 2005). ZipA homologues are not found outside the ?-proteobacterial family, but "the requirement for ZipA can be bypassed completely by a single alteration in a conserved residue of FtsA" (Geissler et al., 2003). There is also evidence to suggest that elevated concentrations of FtsA (which is far more widely distributed) can compensate for a lack of ZipA. For example, FtsA is present in significantly higher concentrations in the Firmicute bacterium *Bacillus subtilis* than in *Escherichia coli* (Feucht et al., 2001). Although a *particular* anchor protein (such as ZipA) is not necessarily required for successful cell division, at least *some* anchor protein is certainly required. I would argue that here we have a case of irreducible complexity, since, unless FtsZ and a tether are present together, the system is useless. Both of these proteins also play a role in the recruitment of other division proteins (Pichoff and Lutkenhaus, 2002).

The FtsZ ring assembles following replication of the bacterial DNA (the nucleoids block FtsZ ring assembly prior to segregation). Location of the cell's center occurs by a very clever mechanism: Proteins called MinC and MinD oscillate from pole to pole, inhibiting assembly of the FtsZ ring

(Dajkovic *et al*., 2008; Shih *et al*., 2003; Johnson *et al*., 2002; Cordell and Lowe, 2001 Shapiro and Losick, 2000; de Boer *et al*., 1992; de Boer *et al*., 1989; de Boer *et al*., 1988). Since the oscillation cycle of MinC and MinD entails that they spend more time at the poles of the cell than the middle, the cell's center has, on average, a lower concentration of these proteins than elsewhere. Midcell suppression of MinC and MinD is facilitated by an additional protein called MinE (Shen and Lutkenhaus, 2011; Sullivan and Maddock, 2000; Raskin and de Boer, 1997). Consequently, the cell's mid-point is most conducive to FtsZ ring assembly. As might be expected given its asymmetrical division, there appear to be no homologues of MinC or MinD in *Caulobacter* (Nierman *et al*., 2001).

Cell Shape Determination

In addition to those proteins that orchestrate cell division, there are also proteins that determine cell shape

629. Peptidoglycan Synthesis

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[1] https://youtu.be/hm8SZaFmlWg f1 and f2 conjugation

[2] Cc https://phys.org/news/2013-12-scientists-closer-rna.html#j http://www.sciencemag.org/news/2016/05/rna-world-

inches-closer-explaining-origins-life

[3] https://www.youtube.com/watch?v=XKiwOZ3oVJw

This not only summarises the chaperone it also takes the reader through protein construction and demolition.

[5] De Duve was a cytologist and biochemist who shared the Nobel Prize for discoveries of peroxisome and lysosome. In addition, he invented scientific names such as autophagy and endocytosis. An atheist and genius he was interested at the end of his long life in evolution and wrote *Vital Dust* in which he essentially took the path of holding that God was impersonal Laws or as he put it, *cosmic imperatives*.

He could not accept the Dumb Luck hypothesis and wrote, *If you equate the appearance of a single bacterial cell to chance assembly of its atoms eternity will not suffice to produce even one*. Instead, it was his opinion that life did arise from

from inanimate chemical molecules, the *vital dust*, but life was forced to do so by the laws of physics and chemistry. He did not speculate on how the imperative laws and their arbitrary constants came into being and showed no particular pathway from unorganised chemicals to organised life.

[6] https://www.ncbi.nlm.nih.gov/pubmed/23438345 and https://www.ncbi.nlm.nih.gov/pubmed/23615196

[7] Taken from Berkley University web site https://evolution.berkeley.edu/evolibrary/article/0_0_0/origsoflife_04