The Attackers: Review: Comments by Susskind; Historical Development of Higher Math": from Newton to Einstein to Quantum Mechanics; Superstring Theory Is a Hypothesis Since Its Major Components Must Be Imagined; Genesis 1:1*a*

41. Susskind wants to avoid "reality" in discussing his theories and rely on empirical "reproducible" evidence which has not been forthcoming to date.

42. Because of His infinitely advance mentality, the mathematics used by our Lord to structure the universe surely included complex numbers since He is the very definition of complexity.

43. The advance in mathematical computations did not become sophisticated until the 1500s according to John C. Baez and John Huerta in their article "The Strangest Numbers in String Theory":

The number system we learned about in school—which mathematicians call the real numbers … is one-dimensional. Before the 1500s the real numbers were the only game in town. During the Renaissance, ambitious mathematicians attempted to solve ever more complex forms of equations, even holding competitions to see who could solve the most difficult problems.[1]

44. Real numbers have no imaginary parts. Complex numbers involve both real and imaginary. The imaginary number is usually the square root of -1, represented by the lower case *i*.

45. A major breakthrough occurred in 1665 when Isaac Newton discovered an early form of differential calculus and a form of integral calculus that enabled him to formulate his laws of motion.

46. Then along came Albert Einstein whose theories of relativity—one called "special" formulated in 1905 which deals with electric and magnetic phenomena and the second called "general" proposed in 1916 dealing primarily with gravitation.

[1] John C. Baez and John Huerta, "The Strangest Numbers in String Theory," *Scientific American*, May 2011, 65.

47. These formulas differ from those used in everyday life and address the physical phenomena ranging from the atom to the universe as a whole.

48. Difficulties arose when these formulas were applied to subatomic particles. This led to the discovery of quantum mechanics:

Quantum mechanics: The subject is entirely a product of researches made in the 20th century, particularly resulting from major contributions by the physicists Werner Heisenberg, Louis de Broglie \brol'-yā\, Erwin Schrödinger, Max Born, and Paul Dirac \di-rak'\ since 1925. The ideas and methods of quantum mechanics have dominated all progress in atomic, nuclear, and molecular physics and chemistry since that year. In the first quarter of the century the principal initial discoveries were made by Max Planck, Albert Einstein, and Niels Bohr.

Before the principles of quantum mechanics were discovered, physicists had taken for granted that motions at the atomic level should be described in terms of the classical mechanics of Isaac Newton. This form of mechanics (classical) was initially developed in connection with the study of motions of bodies, such as planets and satellites of the solar system or bodies of all kinds that are large compared with the atoms of which they are composed.

The use of classical Newtonian mechanics to describe electronic motions within atoms was initiated by Bohr in 1913 and found to have considerable success. But by 1925 this approach had run into difficulties; physicists realized that the principles of quantum mechanics differ drastically from those of Newtonian mechanics.[2]

49. Emerging from the discovery of quantum mechanics, theoretical physicists used its mathematics to develop the idea of supersymmetry which refers to the balance between matter and the forces of nature:

Every matter particle (such as an electron) has a partner particle that carries a force. And every force particle (such as a photon, the carrier of the electromagnetic force) has a twin matter particle.

[2] Edward U. Condon. "Mechanics, Quantum," in *The New Encyclopaedia Britannica*, 15th ed., (Chicago: Encyclopaedia Britannica, 1979), 11:793.

Supersymmetry also encompasses the idea that the laws of physics would remain unchanged if we exchanged all the matter and force particles. … the theory is so seductively beautiful and has led to so much enchanting mathematics that many physicists hope and expect that it is real.[3]

50. Supersymmetry is a major concept regarding string theory. The description of this theory is so esoteric that it defies a coherent explanation for anyone not an expert in theoretical physics.

51. Nevertheless, here is a super, non-symmetric simplification of the idea: In 1845, English mathematics professor, Arthur Cayley \kā'-lē\ published a paper on the discovery of octonions.

52. There are four categories of numbers in quantum mechanics: (1) real numbers (1, 2, 3 …), (2) complex numbers (√-1), (3) quaternions (four dimensions), and (4) octonions (eight dimensions, also called Cayley numbers).[4]

53. When the eight imaginary dimensions of octonions are added to the three observable dimensions of space the resultant 11-dimensional universe produces the mathematics that enable theoretical physicists such as Leonard Susskind to propose string theory as a solution to unresolved problems associated with subatomic particles.

54. Superstring theory is supposedly the solution to the as yet unresolved unification of general relativity and quantum mechanics. If proved valid, then it would become what theoretical physicists refer to as the "theory of everything" or "reality."

55. Well, what is reality? It's whatever truth reveals. What is truth? It's whatever God reveals.

56. God reveals through His Word, but He also reveals that which man is motivated to discover with the mentality imputed to his soul at physical birth.

[3] Baez and Huerta, "The Strangest Numbers in String Theory," *Scientific American*, 65.
[4] Ibid.

57. Objectivity requires that for cosmological truths to be verified, they may not rely on human deductions or conclusions but from proof revealed by the creation.

58. Science must rely on empirical evidence to substantiate hypotheses and theories. If from this process science declares that a "law of nature" has been verified, then it may be generally accepted as a reality until subsequent experiments prove otherwise.

59. However, there is a Source that serves as a final arbiter between speculation and validation: whenever scientific speculation contradicts the Bible, such speculation is inaccurate and therefore not validated as truth or "reality."

60. Superstring theory may turn out to be validated by scientific experimentation, but this will be an extremely difficult task for the theoretical physicists since the "strings" are one dimensional and therefore must be imagined.

61. Regardless of the outcome, these scientists still have not answered the age-old question, "*How* was the universe created?" We delve into that subject next as we consult the Word of God for the answer.

Genesis 1:1 - In the beginning God created the heavens and the earth.

1. The opening prepositional phrase marks the beginning of time. Up to this point the universe did not exist although God, Who is eternal, did.

2. At a certain point in what we refer to as eternity past, God made the decision to create the universe made up matter, energy, and space and in a continuum called time.

3. The words for "in the beginning" are the preposition בְּ (***b^{e}***) and the verb רֵאשִׁית (***re'shith***).

