# The Grand Design

## Significant Pages – Index

By **Nick Ray Ball** 3rd March 2021


Welcome to this quickly made essay on the significant incites gained from the book: The Grand Design by Stephen Hawking and Leonard Mlodinow.

In particular, this essay shines a light on the Feynman sum over histories, a tool for calculating quantum mechanical probabilities. Technology 6. S-World UCS™ and its 87 quintillion histories are based on the Feynman Sum over histories, and much of this part of the book is spent on the refinement/compression technique QCD renormalization, if we can simulate or mimic this quality within the S-World Angelwing framework, it would greatly increase the power of the system, not only 87 quintillion histories (each a simulation with up to 1 billion actions recorded) but 87quintillion **interesting** histories.


**by Leonard Mlodinow and Stephen Hawking**

Taking a step back we start at the beginning with only 4 histories.

History 1 was a fluke of sorts; it tracks the progress of a company that can within 3 years of birth can afford to start 2 new companies each year, which ends up as more than half of global GDP slightly before 2080.

Second, for Malawi, comes the powerful History 2 which demonstrates Technology 7. Š-ŔÉŚ™ and catapults Malawi from almost Zero to One percent of GDP by 2051. This history battles through 15 years of simulated recessions and a great depression, but each year by adjusting É and Ś it increases its cash flow.

History 3 is the most seen History, when you see spreadsheets, they usually derive from History 3, which is itself a more cautious version of History 2, which only includes a small token figure for trade. This leads us to ⌂≥ÉL - as long as we make more money from Suburb Sales (which would have been signed off years before we started) that we lose from ÉL (cash flow spending to non-network companies) then we have a determined economic superposition that provides monopoly rents to hundreds of thousands and later millions or even billions of companies.

History 4. I have recently started a UCS simulation for the UK, and I am considering History 5 might be Tanzania so when we say we have 87 quintillion histories we are saying in place of the 5 histories (simulations) we have now, between 2024 and 2080 we will have made 87,714,630,433,327,500,000 histories (simulations) or an awful lot more if we can create a compression similar to renormalization, in the Feynman sum over histories. For more on this read on…

# Sixty-Four Reasons Why

## (Complete Book 10.73-n53) Feb 2020

# The Grand Design

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## What-Is-Reality

**A Good Model**

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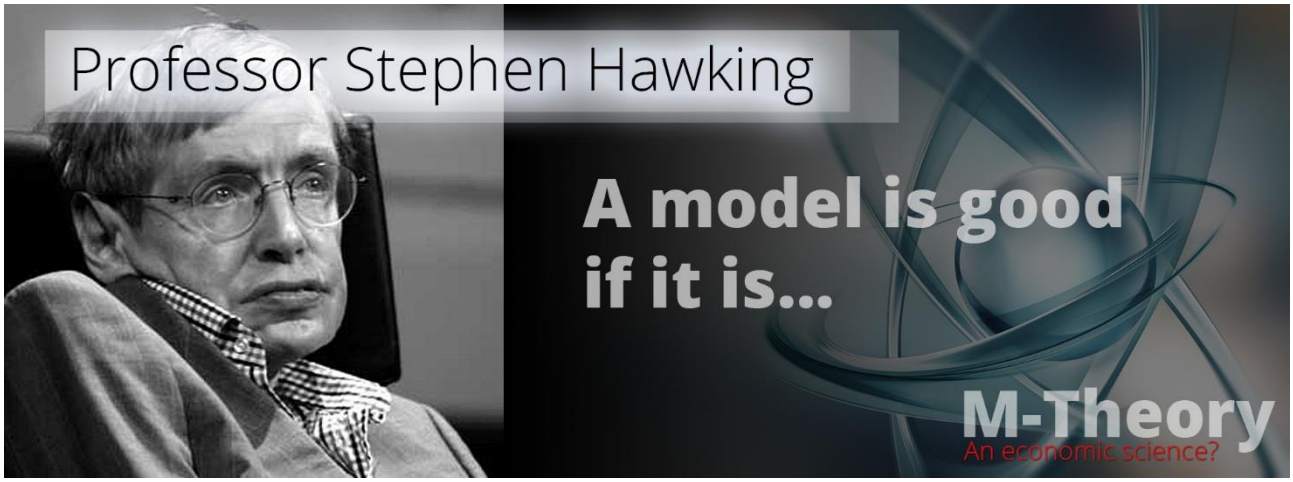
BEYOND **87 Quintillion Histories**, AND

## The Conclusion of The Grand Design

# 1. THE GRAND DESIGN

## **Chapter 3:** What-Is-Reality




"A model is a good model if it:

1. Is Elegant

   Elegance is not something easily measured, but it is highly prized amongst scientist because laws of nature are meant to economically compress a number of particular cases into one simple formula.

   Elegance refers to the form of a theory, but it is closely related to a lack of adjustable elements since a theory jammed with fudge factors is not very elegant. To paraphrase Einstein, '**a theory should be as simple as possible, but not simpler.'**

2. Contains few arbitrary or adjustable elements
3. Agrees with and **explains all existing observations**
4. **Makes detailed predictions** about future observations that can disprove or falsify the model if they are not borne out."

From The Grand Design by Professors **Stephen Hawking** and **Leonard Mlodinow**

# Hawking's Good Model and **S-World Angelwing**

## 1. To be elegant, or not?

Within S-World Angelwing there are some elegant, even beautiful systems. For example, the A<>B$^{st}$, and the POP family; POP the POP Train and Angel POP. However, after reading Danny Rodrik's Straight Talk on Trade and realizing that some elegant models (such as the efficient market hypothesis in economics) can be dangerous and need complexity added to stop them from flying or falling apart. Thus, we need to allow inelegant complexity in our systems.

For the specifics of the complexity within Supereconomics book 1. S-World AngelWing - THE WHAT, I have presented Hawking and Mlodinow on M-theory - a network of interlinked theories that do not present a complete universal map; rather, have different solutions for different areas within the landscape. Working in this way, we can further improve and broaden S-World Angelwing's economic design.

I consider that there may well be some underlying elegant theory, in both theoretical physics and economics, that we are yet to find. But until we find it, we can use Chaos methods (POP), M-theory (M-Systems), Quantum Mechanics, Relativity and the Rodrik theory of choosing the best theory to fit the circumstance in economics, seeking to build an economic map where all economic theories have their place.

In conclusion, whilst elegance is desired, we do not need to seek to make a purely elegant model; and, currently, we are free to use whatever system or theory that seems appropriate for each circumstance.

With this said, in the S-World Grand Network's market economy, S-World Angelwing evaluates Special Project internalities; then the internalities of all Grand Network companies, then the externalities, and makes decisions; such as the price of goods above or below the margin, that creates the best overall picture that **follows the paths described in Beyond 87 Quintillion Histories.**

## 2. Contains few arbitrary or adjustable elements and a lack of adjustable parameters

Currently, we are only using POP, ŔÉŚ, the Peet Tent, Susskind Boost and Net-Zero DCA as laws. There can, of course, be millions of different applications, like nature has only 4 fundamental laws (gravity, electromagnetism, the strong and weak nuclear forces) and many wonderful animals, trees, flowers and bees; and computers have only a few OS's and millions of apps and billions of websites to look at.

But so far in S-World, all applications and environments are fundamentally a part of the four laws; POP, ŔÉŚ, the Peet Tent and Susskind Boost which is turned into strategy by Net-Zero DCA.

From these 5 laws come a host of 'big in their own right' applications, that have

reached what Paul Romer describes as a combinatorial explosion in economics (If Š-ŔÉŚ™ holds).

## 3. Agrees with and explains all existing observations

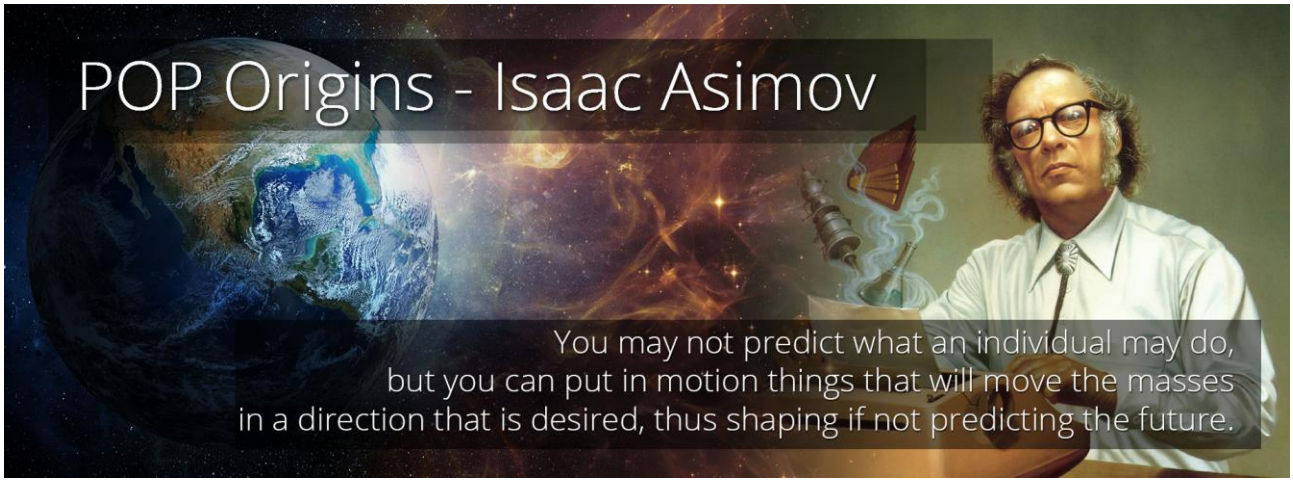
When it comes to the differences in opinion on what is the correct economic theory, there are many. The (As-If) M-theory design of S-World Angelwing allows for a map of many economic theories, some agreeing, some not, and then it throws them forwards and back from 2024 to 2080 about 87 quintillion times. That's 87,714,630,433,327,500,000 separate simulations or (as I say) histories, and each history has a billion points that can record an action, to assist S-World Net-Zero DCA strategies.

If we can As-If reverse engineer QCD renormalization into the system, which is now looking more feasible thanks to ideas from quantum loop gravity and calculus. The idea from calculus being the splitting of the problem of the world economy into many separate S-World business, then as long as this foundation is solid, the house will stand. And newest from quantum theory is the quantization of Network Credits. (the money in the network)

In as much as explaining all existing observations, we have 87,714,630,433,327,500,000 simulations/observations/histories to choose from, indeed the choice of future paths and histories now becomes the most important job in S-World. A Job for M-System 11. QuESC

## 4. Makes detailed predictions about future observations that can disprove or falsify the model if they are not borne out."

This point created the idea for the 87 quintillion histories idea (from the now to 2080) that will shine a light on the future and help us fulfil Asimov's quest.



*"You may not predict what an individual may do, but you can put in motion things that will move the masses in a direction that is desired, thus shaping if not predicting the future."* - Isaac Asimov

## Next

# **The S-World UCS™** M-Systems

From S-World Story 12.

## M-Systems and Special Projects

**24th November 2017**


S-World UCS™ creates many different simulations for each business and becomes the training and recruitment tool for the network. It is intrinsically linked to the TBS™ and is, in fact, the way the stakeholders in a business run their business. And a key ingredient to S-World UCS™ is that it allows all the personnel in a company to make their own simulations, and then the company (as a whole) chooses the best outcomes from all scenarios. It is a very inclusive system.

This story starts at a point when RES was the least detailed M-System, whereas now the three

Supereconomics books THE WHAT, THE HOW and THE WHY are all built upon RES in 2019: Š-ŔÉŚ™ Financial Engineering.

So, let's go back to the future, November 24th, 2017 and **'The S-World UCS M-Systems.'**

www.angeltheory.org/the-s-world-ucs-m-systems

# 2. "As-**If**"

## THE GRAND DESIGN

## **Chapter 4.** Alternative Histories

One book has been a constant companion since 2016; The Grand Design by Professors **Stephen Hawking** and **Leonard Mlodinow.**

We have seen how Hawking and Mlodinow's Good Model added order to the process, and as you will see in chapter 4. Alternate Histories tells the story of, the Feynman Sum Over Histories. Exactly how we got from reading this to three years later having a comparable hypothesis in economics is not clear, like all **'As If'** analogies, we are not talking about Supereconomics being the same as the physics, rather Supereconomics acts **As-If** it was the physics.

# "As-**If**"

If memory serves, I first heard of **As-If** from 2017 Nobel winner Richard H. Thaler, who was not a fan but needed to acknowledge **As-If** arguments were valid.

Many of the S-World Systems were created in **As-If** this or that system is from particle physics, the most obvious is the M-Systems created **as-if** M-Theory could be used to create or improve economic models, and the catchphrase we see on many early graphics **"M-Theory an Economic Science?"** but we need not get into this here.

The most recent **As-If** example relates to the most fundamental property of quantum mechanics, the Quanta. If quantum mechanics and LQG (Loop Quantum Gravity) everything is made in quanta, the smallest possible quanta being Planck's constant which is very small (6.62607004 × 10-34 m2 kg/s). Whilst there is such a large number of quanta in the universe, the idea of quanta is that all could be measured. There is an exact number of quanta today that will be the same tomorrow or in a billion years.

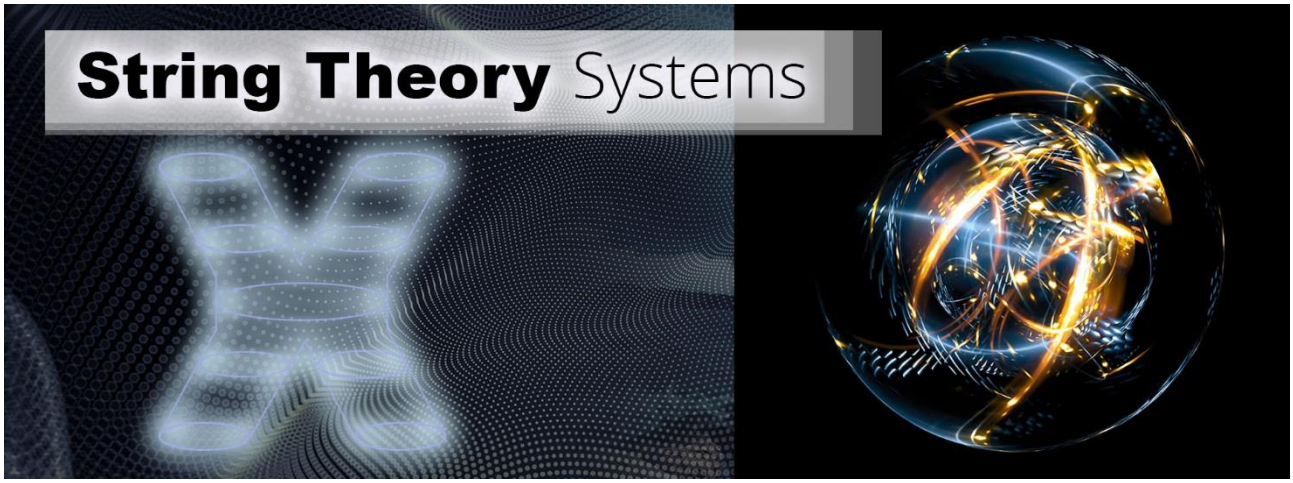
In the following sections from **the Grand Design** by Professors Stephen Hawking and Leonard Mlodinow, we will hear about Alternate Histories (The Feynman Sum Over Path/Histories) and Renormalization. Where renormalization removes the infinities and offers a coherent data set that is used to create accurate predictions.

While I do not understand the mathematics of renormalization at this time, it would be a

massive advantage if we could use the renormalization effect to compress the 87 Quintillion Histories. And it may be possible to push the envelope and change the 87 Quintillion histories into 87 quintillion, quintillion or even  87 quintillion, quintillion, quintillion, quintillion.

The advantages are massive if we can renormalization S-Worlds' 87 Quintillion simulations **As-If** the network was quantum mechanics. And whilst I am miles away from performing such a calculation, I have reinforced by the earlier idea of POP Đimensions, which started at $0.01 cent and multiplied up through cubic dimensions of 8, so $0.001 >$0.08, >$0.64 >$5.12 > $40.96 but changed the POP Đimensions to start at $0.0001 cents, $0.0001 > $0.0008 > $0.0064 > $0.0512 > $0.4096 **As-If** by doing so I am mimicking the quanta in quantum mechanics so that at a later point someone with greater knowledge could perform renormalization.

Sticking with math that is compatible with quantum mechanics, this example may well end off with two completely different systems. One could imagine a system per Quantum Loop Gravity as presented above and another system and even another Grand Śpin Network where the fabric of the system was created **As-If** Money is analogous to the Strings in String Theory.




Three M-Systems were inspired by string theory, M-Systems Zero that simply says in Supereconomics money is the String, M-System 3. The Susskind Boost…

# 3.The Grand Design

## Chapter 5. The Theory of Everything


The known forces of nature can be divided into four classes:

1. **Gravity.** This is the weakest of the four, but it is a long-range force and acts on everything in the universe as an attraction. This means that for large bodies the gravitational forces all add up and can dominate over all other forces.

2. **Electromagnetism.** This is also long-range and is much stronger than gravity, but it acts only on particles with an electric charge, being repulsive between charges of the same sign and attractive between charges of the opposite sign. This means the electric forces between large bodies cancel each other out, but on the scales of atoms and molecules, they dominate. Electromagnetic forces are responsible for all of chemistry and biology.

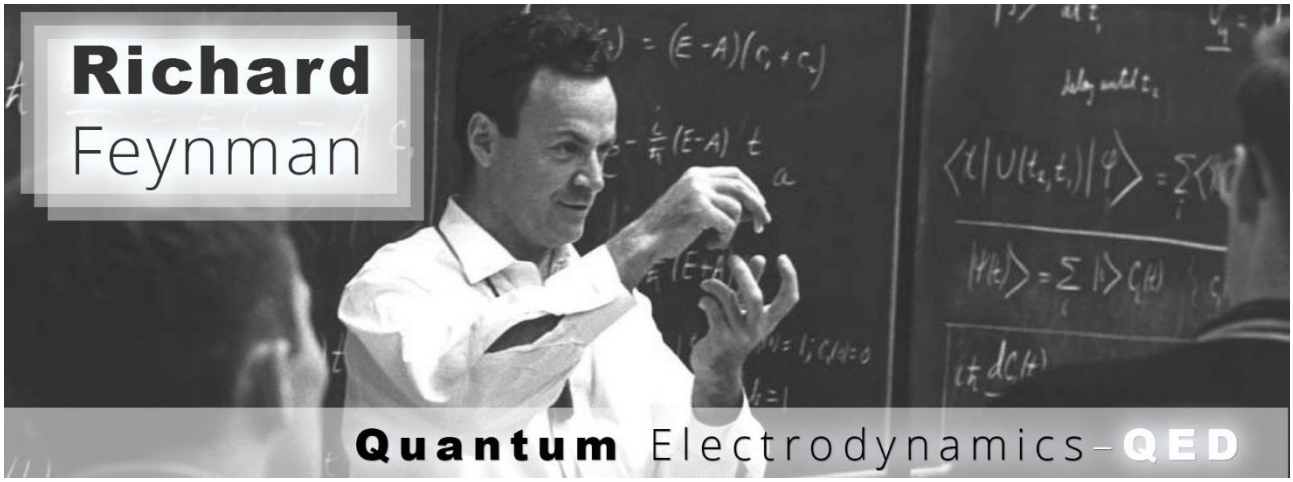
3. **Weak Nuclear Force.** This causes radioactivity and plays a vital role in the formation of the elements in stars and the early universe. We don't, however, come into contact with this force in our everyday lives.

4. **Strong Nuclear Force.** This force holds together the protons and neutrons inside the nucleus of an atom. It also holds together the protons and neutrons themselves, which is necessary because they are made of still tinier particles; quarks. The strong force is the energy source for the sun and nuclear power, but, as with the weak force, we don't have direct contact with it.

The first force for which a quantum version was created was electromagnetism. The quantum theory of the electromagnetic field called quantum electrodynamics, or QED

for short, was developed in the 1940s by Richard Feynman and others and has become a model for all quantum field theories.

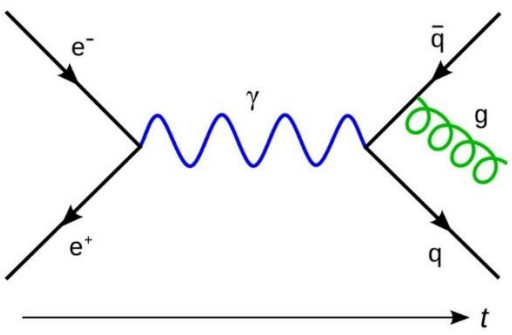
A particle of light is an example of a boson. According to QED, all the interactions between charged particles—particles that feel the electromagnetic force—are described in terms of the exchange of photons.




The predictions of QED have been tested and found to match experimental results with great precision. But performing the mathematical calculations required by QED can be difficult. The problem, as we'll see below, is that when you add to the above framework of particle exchange the quantum requirement that one include all the histories by which an interaction can occur—for example, all the ways the force particles can be exchanged—the mathematics becomes complicated. Fortunately, along with inventing the notion of alternative histories—Feynman also developed a neat graphical method of accounting for the different histories, a method that is today applied not just to QED but to all quantum field theories.

**Feynman's graphical method provides a way of visualizing each term in the sum over histories.** Those pictures, called **Feynman diagrams**, are one of the most important tools of modern physics. **In QED the sum over all possible histories can be represented as a sum over Feynman diagrams.**

**Feynman**
Diagrams



**The process of renormalization involves subtracting quantities that are defined to be infinite and negative in such a way that, with careful mathematical accounting, the sum of the negative infinite values and the positive infinite values that arise in the theory almost cancel out, leaving a small remainder, the finite observed values of mass and charge.**

Once we have fixed the mass and charge of the electron in this manner, we can employ QED to make many other very precise predictions, which all agree extremely closely with observation, **so renormalization is one of the essential ingredients of QED.**


The success of renormalization in QED encouraged attempts to look for quantum field theories describing the other three forces of nature. People have therefore sought **a theory of everything** that will unify the four classes into a single law that is compatible with quantum theory. This would be the holy grail of physics.

The strong force can be renormalized on its own in a theory called QCD, or quantum chromodynamics. Since earlier observational evidence had also failed to support GUTs (Grand Unified Theories), most physicists adopted an ad hoc theory called the standard model, The standard model is very successful and agrees with all current observational evidence**,** but it is ultimately unsatisfactory because it does not include gravity.

The **closed loops** in the Feynman diagrams for gravity produce infinities that cannot be absorbed by renormalization because in general relativity there are not enough renormalizable parameters (such as the values of mass and charge) to remove all the quantum infinities from the theory. We are therefore left with a theory of gravity that predicts that certain quantities, such as the curvature of space-time, are infinite, which is no way to run a habitable universe. That means the only possibility of obtaining a sensible theory would be for all the infinities to somehow cancel, without resorting to renormalization.

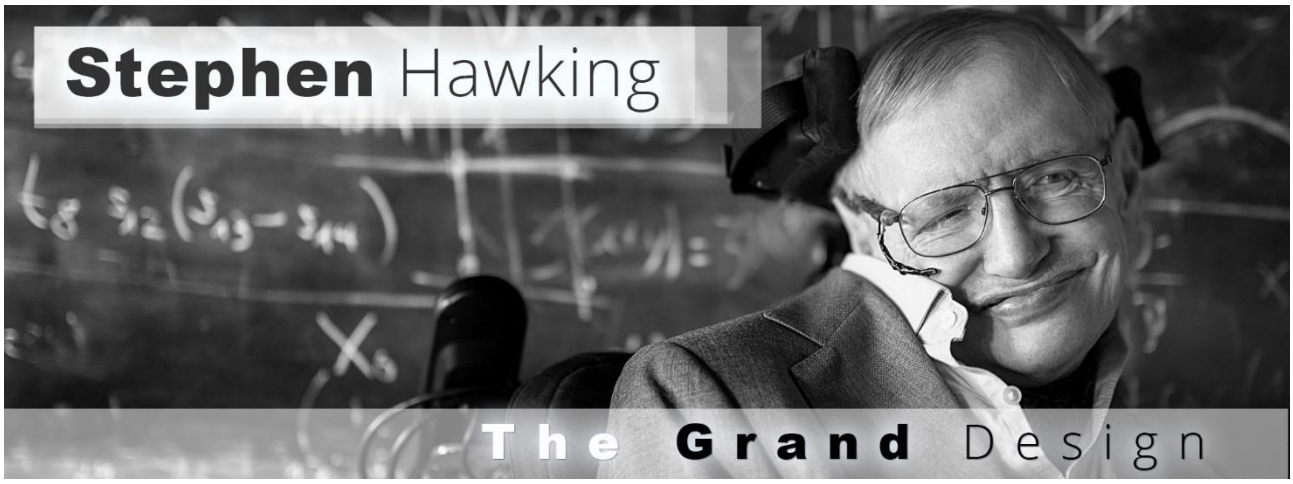
In 1976 a possible solution to that problem was found. It is called supergravity. **The prefix "super" was not appended because physicists thought it was "super"** that this theory of quantum gravity might actually work. Instead, **"super" refers to a kind of symmetry the theory possesses, called supersymmetry.**


**In physics a system is said to have a symmetry if its properties are unaffected by a certain transformation** such as rotating it in space or taking its mirror image.

One of the important implications of supersymmetry is that force particles and matter particles, and hence force and matter, are really just two facets of the same thing. Practically speaking, that means that each matter particle, such as a quark, ought to have a partner particle that is a force particle, and each force particle, such as the photon, ought to have a partner particle that is a matter particle. This has the potential to solve the problem of infinities because it turns out that **the infinities from closed loops of force particles are positive while the infinities from closed loops of matter particles are negative**, so the infinities in the theory arising from the force particles and their partner matter particles tend to cancel out.

The idea of **supersymmetry** was the key to the creation of supergravity, but the concept had actually originated years earlier with theorists studying a fledgling theory called **string theory.** String theories also lead to infinities, but it is believed that in the right version they will all cancel out. They have another unusual feature: They are consistent only if space-time has ten dimensions.

Then, around 1994, people started to discover dualities—that different string theories, and different ways of curling up the extra dimensions, are simply different ways of describing the same phenomena in four dimensions. Moreover, they found that supergravity is also related to the other theories in this way. String theorists are now convinced that the five different string theories and supergravity are just different approximations to a more fundamental theory, each valid in different situations.




**That theory is called M-theory**. No one seems to know what the "M" stands for, but it may be "master," "miracle," "matrix, "or "mystery." It seems to be all four. People are still trying to decipher the nature of M-theory, but that may not be possible. It could be that the physicist's traditional expectation of a single theory of nature is untenable, and there exists no single formulation. **It might be that to describe the universe, we have to employ different theories in different situations.** Each theory may have its own version of reality, but according to model-dependent realism, **that is acceptable so long as the theories agree in their predictions whenever they overlap,** that is, whenever they can both be applied.

Whether M-theory exists as a single formulation or only as a network, we do know some of its properties. First, M-theory has eleven spacetime dimensions, not ten.

The mathematics of the theory restricts the manner in which the dimensions of the internal space can be curled. **The exact shape of the internal space determines both the values of physical constants, such as the charge of the electron, and the nature of the interactions between elementary particles.** In other words, it determines the apparent laws of nature. We say "apparent" because we mean the laws that we observe in our universe—the laws of the four forces, and the parameters such as mass and charge that characterize the elementary particles.

But the more fundamental laws are those of M-theory."

End of Extract from:
**The Grand Design**
CHAPTER 5. THE THEORY OF EVERYTHING.
by Professors **Stephen Hawking** and **Leonard Mlodinow**

# 4. The Grand Design

## Chapter 8. The Grand Design

## Beyond 87 Quintillion Histories, and The Conclusion of The Grand Design

The previous extract links the idea of Alternate Histories with renormalization, Supersymmetry, String Theory and M-Theory, but misses out on LQG (Loop Quantum Gravity.)

I have included the section primarily in the hope that someone, (be they economist, engineer, physicist, mathematician or other) will be able to apply the renormalization or find an As-If renormalization method to go beyond 87 quintillion histories.

Currently in the broad spectrum of 2020 to 2080 with 1 billion Simulation Events there remains 87,714,630,433,327,500,000 (87 quintillion histories). But as we have seen, we may need more than a billion Simulation Events per history. Renormalization, if it can be applied direct or **As-If** could effectivly increase simulations by many zeros like: 87,714,630,433,327,500,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000

or

87,714,630,433,327,500,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000

So whilst it's out of my sphere of command of knowledge, it may be possible by specialists. One thing I have done to assist this process is to quantize Network Credits (see spreadsheet tab POP Đimensions (3)).

Even if we can't do renormalization, the Grand Design section is important as it shows the importance of paths and histories in particle and theoretical physics, which I hope increases the importance of the histories approach to economics we adopt in Supereconomics.

As for Supersymmetry, the physics that helped name Supereconomics, I now have two clear examples, the As-If SUSY Hierarchal Spin Equalizer from 2012 seen right (or below if reading the PDF). And the Superpartner approach to how individual companies in the Malawi Grand Śpin Network expand into larger Đimensional networks that were created while writing this chapter. And is looking good as a major system for modelling the path of small companies into large networks.