The Grand Design
Chapter 8. **The Grand** Design

by Professors **Stephen Hawking** and **Leonard Mlodinow**

BEYOND 87 Quintillion Histories, and the Conclusion of The Grand Design

From Supereconomics Book 3 – 64 Reasons Why – Complete Book.

The previous extract links the idea of Alternate Histories with renormalization, Supersymmetry, String Theory and M-Theory, but misses out 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

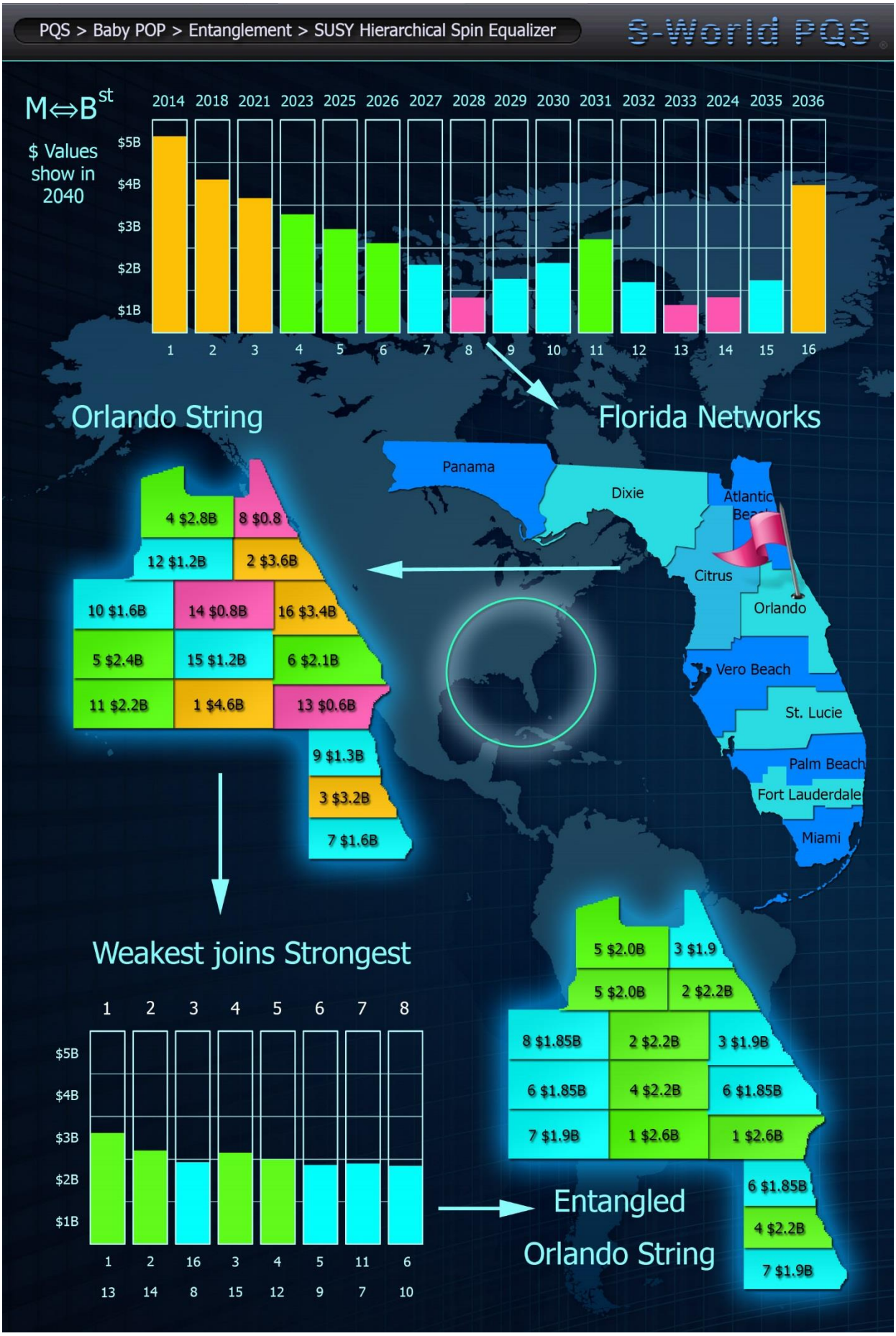
or

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.


PQS > Baby POP > Entanglement > SUSY Hierarchical Spin Equalizer
S-World PQS
M⇔B st
$ Values show in 2040
2014 2018 2021 2023 2025 2026 2027 2028 2029 2030 2031 2032 2033 2024 2035 2036
$5B
$4B
$3B
$2B
$1B
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Orlando String
Florida Networks
Panama
Dixie
Atlantic Beach
Citrus
Orlando
Vero Beach
St. Lucie
Palm Beach
Fort Lauderdale
Miami
4 $2.8B
8 $0.8
12 $1.2B
2 $3.6B
10 $1.6B
14 $0.8B
16 $3.4B
5 $2.4B
15 $1.2B
6 $2.1B
11 $2.2B
1 $4.6B
13 $0.6B
9 $1.3B
3 $3.2B
7 $1.6B
Weakest joins Strongest
1 2 3 4 5 6 7 8
$5B
$4B
$3B
$2B
$1B
1 2 16 3 4 5 11 6
13 14 8 15 12 9 7 10
5 $2.0B
3 $1.9
5 $2.0B
2 $2.2B
8 $1.85B
2 $2.2B
3 $1.9B
6 $1.85B
4 $2.2B
6 $1.85B
7 $1.9B
1 $2.6B
1 $2.6B
6 $1.85B
4 $2.2B
7 $1.9B
Entangled
Orlando String

Unfortunately, despite many attempts at the LHC (Large Hadron Collider), no trace of supersymmetry or string theory has been detected. What that means for M-theory can't be good. But does not stop the basic idea of Supereconomics as an economic theory attributing the idea of many maps of economics that may vary in places but agree in important places.

Hawking:
"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."

Getting back to renormalization and the Feynman Sum Over histories I have done some research and found mention of QCD, Renormalization and paths/histories in Carlo Rovelli's; Reality Is Not What It Seems: The Journey to Quantum Gravity.

The Following is from in Carlo Rovelli's book;

Systems in Quantum Theory

A physical system manifests itself only by interacting with another. The description of a physical system, then, is always given in relation to another physical system, one with which it interacts. Any description of a system is therefore always a description of the information which a system has about another system, that is to say; the correlation between the two systems.

The description of a system, in the end, is nothing other than a way of summarizing all the past interactions with it and using them to predict the effect of future interactions.

Consider two simple postulates:

(1) The relevant information in any physical system is finite.
(2) You can always obtain new information on a physical system

Here the relevant information is the information that we have about a given system as a consequence of our past interactions with it. Information allowing us to predict what will be the result for us of future interactions with this system.

The first postulate characterises the granularity of quantum mechanics, the fact that a finite number of possibilities exists.

The second characterizes its indeterminacy, the fact that there is always something and unpredictable which allows us to obtain new information. When we acquire new information about a system; total relevant information cannot grow indefinitely because of the first postulate, **and part of the previous information becomes irrelevant, that is to say, it no longer has any effect upon predictions of the future.**

In quantum mechanics when we interact with a system, we don't only learn something we also cancel a part of the relevant information **about the system.**

The entire formal structure of quantum mechanics follows in large measure from these two simple postulates, therefore the theory lends itself in a surprising way to being expressed in terms of information.

Reality Is Not What It Seems

The Journey to Quantum Gravity

By Carlo **Rovelli**

I included this section because of the cancelling out method of compression, cancelling new histories that we know from experience will make no change is important. *(we need to make room for new storage)*

Another book on a similar subject is Quantum Space – Loop Quantum Gravity and the Search for the Structure of Space, Time, and the Universe by Jim **Baggott**

This book championed the **As-If** reasoning method in:

As If – Mass Renormalization

Re Normalization,
We do not need to make the mathematics of the network work exactly like quantum mechanics to use Renormalization. All we need to do is teach the AI to govern the histories **As-if** it was using renormalization, to remove infinities or in our case places where data is of no use.

"Mass **Renormalization**

The theorists realised that the problems with the early version of QED were a result of the electron interaction with its own self-generated electromagnetic field, causing some terms in the equations to mushroom to infinity. As a result of these interactions, the electron gathers a covering of virtual particles around itself. These virtual particles have energy, and as we know from $M=E/C^2$ the mass of such a dressed electron is, therefore, greater than its bare-mass, or the mass the election would be expected to possess if it could be separated from its own electromagnetic field. It's impossible to know the bare mass of the electron is, but the equations of QED could now be manipulated to solve the problem.

The theorists discovered that subtracting the equation describing the electron in one physical situation, from the equation describing in the electron in a different situation, meant that they could get rid of infinite terms. Subtracting infinity from infinity doesn't seem on the surface to be a very sensible thing to attempt, but it was found that the result was not only finite it was also right.

This sleight of hand is called Mass Renormalization."

Quantum Space

Loop Quantum Gravity
and the Search for the Structure of
Space, Time, and the Universe
By Jim **Baggott**

Don't let the big words fool you into thinking I understand the two books above, The Grand Design I'm familiar with, but The Journey to Quantum Gravity and Quantum Space is a big test, but I had been looking for more detail on the Feynman Sum Over Histories and QCD renormalisation and these books delivered.

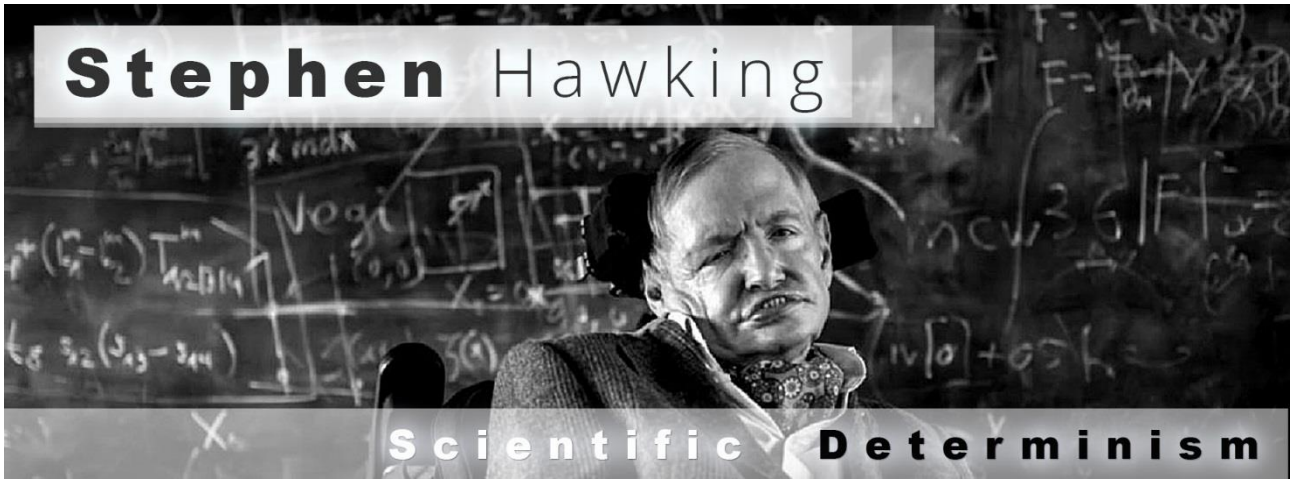
I know only bits of the books. A big leap was however taken in understanding the quantization principle and applying it to our money (network credits), so now there is no unit smaller than 0.0001 cents, which I hope will eventually lead to a way to cancel the uneventful histories **As-If** they were infinities.

There may be a simpler way to cancel null interest results using calculus, which uses infinities such as Pi or 33.333333… to work out solutions to much bigger problems, for instance, the global economy seen throughout the eyes of S-World Angelwing can be shepherding the micro day to day spending of all in the network, would be more manageable than it is now.

Whilst there is no specific point from the following section, it is nice to know the end of the Grand Design story. And note I will be approaching Leonard Mlodinow and Lucy Hawking about the use of this chapter and the previous ones.

The Grand Design
Chapter 8. **The Grand** Design

by Professors **Stephen Hawking** and **Leonard Mlodinow**



We leave this chapter with an edit of the concluding chapter in The Grand Design: For no reason in particular other than the sharing of how a black hole is created and how it contains positive energy.

Scientific Determinism: There must be a complete set of laws that, given the state of the universe at a specific time, would specify how the universe would develop from that time forward. These laws should hold everywhere and at all times; otherwise they wouldn't be laws. There could be no exceptions or miracles.

Even a very simple set of laws can produce complex features similar to those of intelligent life. Any set of laws that describes a continuous world such as our own will have a concept of energy, which is a conserved quantity, meaning it doesn't change in time. The energy of empty space will be a constant, independent of both time and position. One can subtract out this constant vacuum energy by measuring the energy of any volume of space relative to that of the same volume of empty space, so we may as well call the constant zero. One requirement any law of nature must satisfy is that it

dictates that the energy of an isolated body surrounded by empty space is positive, which means that one has to do work to assemble the body. That's because if the energy of an isolated body were negative, it could be created in a state of motion so that its negative energy was exactly balanced by the positive energy due to its motion. If that were true, there would be no reason that bodies could not appear anywhere and everywhere. Empty space would therefore be unstable. But if it costs energy to create an isolated body, such instability cannot happen, because, as we've said, the energy of the universe must remain constant. That is what it takes to make the universe locally stable—to make it so that things don't just appear everywhere from nothing.

If the total energy of the universe must always remain zero, and it costs energy to create a body, how can a whole universe be created from nothing? That is why there must be a law like gravity. Because gravity is attractive, gravitational energy is negative: One has to do work to separate a gravitationally bound system, such as the earth and moon. This negative energy can balance the positive energy needed to create matter, but it's not quite that simple. The negative gravitational energy of the earth, for example, is less than a billionth of the positive energy of the matter particles the earth is made of. A body such as a star will have more negative gravitational energy, and the smaller it is (the closer the different parts of it are to each other), the greater this negative gravitational energy will be. But before it can become greater than the positive energy of the matter, the star will collapse to a black hole, and black holes have positive energy. That's why empty space is stable. Bodies such as stars or black holes cannot just appear out of nothing. But a whole universe can.

Because gravity shapes space and time, it allows space-time to be locally stable but globally unstable. On the scale of the entire universe, the positive energy of the matter *can* be balanced by the negative gravitational energy, and so there is no restriction on the creation of whole universes. Because there is a law like gravity, the universe can and will create itself from nothing. Spontaneous creation is the reason there is something rather than nothing, why the universe exists, why we exist. It is not

necessary to invoke God to light the blue touch paper and set the universe going.

Why are the fundamental laws as we have described them? The ultimate theory must be consistent and must predict finite results for quantities that we can measure. We've seen that there must be a law like gravity, and that for a theory of gravity to predict finite quantities, the theory must have what is called **supersymmetry** between the forces of nature and the matter on which they act. **M-theory is the most general supersymmetric theory of gravity. For these reasons M-theory is the *only* candidate for a complete theory of the universe.** If it is finite—and this has yet to be proved—it will be a model of a universe that creates itself. We must be part of this universe, because there is no other consistent model.

M-theory is the unified theory Einstein was hoping to find. The fact that we human beings—who are ourselves mere collections of fundamental particles of nature—have been able to come this close to an understanding of the laws governing us and our universe is a great triumph. But perhaps the true miracle is that abstract considerations of logic lead to a unique theory that predicts and describes a vast universe full of the amazing variety that we see. **If the theory is confirmed by observation,** it will be the successful conclusion of a search going back more than 3,000 years. **We will have found the grand design.**