Physicists have discovered that empty space turns out to not be empty, but is in fact a writhing sea of energy. Scientists calculate that one teaspoon of empty space contains enough energy to boil all the oceans of the world. Seen in this perspective, physical matter can be seen more as a froth appended to the churning sea. Traditionally, physicists have ignored the effects of the quantum vacuum, or Zero Point Field, saying it cancels itself out.

Abstracted from *The Field* a book by Lynn McTaggart

"Hal was eventually to demonstrate in a paper published by *Physical Review*, one of the world's most prestigeous physics journals, that the stable state of matter depends for its very existence on a dynamic interchange of subatomic particles with the sustaining zero-point energy field." The Field pg 24

Quantum physicists struggled with the question of why an electron orbits around a proton, like a planet orbiting around the sun. In the atomic world, any moving electron, which carries a charge, would eventually radiate away its energy and spiral into the nucleus, causing the entire atomic structure to collapse. pg 24

Niels Bohr's explanation was that an electron radiates only when it jumps from one orbit (energy level) to another and that the orbits have to have the proper difference in energy to account for any emission of photon light. This rule lead to further assumptions about matter and energy having both wave and particle like characteristics, which kept electrons in their place and in particular orbits, and ultimately to the development of quantum mechanics. pg 25.

But what Timothy Boyer had done, and Hal then perfected, was to show that if you take into account the Zero Point Field, you don't have to depend on Bohr's model. You can show mathematically that electrons loose and gain energy constantly from the ZPF in dynamic equilibrium, balanced at exactly the right orbit. Electrons get their energy to keep going because they are refueling by tapping into these fluctuations of empty space,pg 25

Hal also showed that fluctuations of the ZPF waves drive the motion of subatomic particles and that all the motion of all the particles generates the ZPF. the waves are simple harmonic (sine) waves. pg 25

One of the most important aspects of waves is that they are encoders and carriers of information. The ZPF is a kind of shadow of the universe for all time; a mirror image and record of everything that ever was. pg 26 (note this is similar in description to the "akashic record".

Some disturbances in the ZPF can be measured. Zero-point fluctuations cause electrons to move a bit in their orbits, leading to shifts in frequency of about 1000 MegaHz. This was discovered by Willis Lamb and developed in the 1940s into wartime radar.??

The Casimer effect is another example: two metal plates placed close together will develop an attraction that pulls them closer together.

The Van der Waals force: Van der Waals found that the forces of attraction and repulsion operate between atoms and molecules because of the way the electrical charge is distributed. It was eventually found that this had to do with a local imbalance of the field. This property allows certain gases to become liquid. Spontaneous emission, when atoms decay and emit radiation for no known reason has also been shown to be a zero point effect.

Timothy Boyer showed that many of the weird properties of subatomic matter which puzzled physicists and led to the formulation of strange quantum rules could easily be accounted for in classical physics, if you include the ZPF: uncertainty, wave-particle duality, the fluctuating motion of particles all had to do with interaction of the ZPF and matter.

Gravity is a mystery to physicists, who have tried to relate it to the EM or nuclear force, without success. Even Einstein, who was able to describe it thru his general theory of relativity, could not explain where it came from.

Hal Puthoff demonstrated mathematically that gravitational effects were entirely consistent with zero point particle motion. pg 28. Tying gravity to ZP energy solved a number of problems that had troubled physicists for centuries. It answered why gravity is weak and cant be shielded (the ZPF can't be shielded). it also explained why we can have positive mass and not negative mass (what about antimatter?)

Puthoff published his theory of gravity to polite and restrained applause. pg 28

Further, "non-locality"; "spooky action at a distance" may be a ZPF property. pg 29

Condensed Charge Physics (nano-technology) Ordinarily, electrons repel each other. However, you can tightly cluster electronic charge if you calculate the characteristics of the ZPF, which at some point will begin to push electrons together like a tiny Casimer force. this enables electronics applications in very tiny spaces.

Eventually Ken Shoulders and Hal would invent a devise that could fit an x-ray devise at the end of a hypodermic needle, and a high frequency signal generator that would allow radar to be generated from a source the size of a credit card.

Bernie Haisch, Alfonso Rueda

Bernie Haisch had read some of Hal's papers and got interested in the ZPF. He was inspired by the work of Paul Davies and William Unruh at the U of BC. They had found that if you move at constant speed through a vacuum, it all looks the same. but as you accelerate, the vacuum begins to appear like a lukewarm sea of heat radiation from your perspective.

Haisch talked Alfonso Rueda into doing a mathematical analysis of an idealized oscillator moving thru the ZPF. He found that an oscillator forced to move thru the ZPF will experience a resistance proportional to the acceleration. Thus Newton's law F = MA can be derived from electrodynamics. Puthoff, Rueda, and Haisch collaborated on a paper that Haisch wrote, and it was published, unchanged, in Physical Review. In the paper they show that inertia is a "lorentz force" - a force that slows particles moving thru a magnetic field.

They also realized their discovery had a bearing on $E=MC^{2.}$ The equation has always implied that energy (one distinct physical entity) turns into mass (another distinct physical entity). They now saw that the relationship of mass to energy was more a statement about the energy of quarks and electrons in what we call matter caused by interaction with the ZPF fluctuations. What they were getting at, was that matter is not a fundamental property of physics. Mass is not "equivalent" to energy; mass IS energy.