The Theoretical Basis For Nikola Telsla's Inventions

(revised)

Dark Matter

In my previous article ("Aether Tunnels To Produce Free Energy For Free Electricity") I concentrated on designing systems for free electricity, and I only looked at the theory that was relevant, derived from Einstein's equation $e = mc^2$. Many people wrote to me to explain dark energy and dark matter which led me to realise that there was an error in my thinking:

> *Astrophysicists can only make sense of the universe if there is what they call dark energy or dark matter, which I call constrained energy. Constrained energy cannot be converted into matter and so there is no dark matter in the universe, only dark energy.*

Which is wrong and dark matter does exist.

In the early universe, the formation of protons P, the nuclei of hydrogen, occurred during the first second after the Big Bang. The emergence of neutral hydrogen atoms H throughout the universe occurred about 370,000 years later during the recombination epoch, when the plasma had cooled enough for electrons to remain bound to protons. As a result hydrogen is the most abundant chemical substance in the universe, constituting roughly 75% of all normal matter.

Hydrogen atoms H are highly unstable and do not exist in normal conditions. So hydrogen, H_2 as we know it, consists of two protons and two electrons held together by electrostatic forces.

Hydrogen has three known isotopes, normal hydrogen (which has no neutrons), deuterium (which has a nucleus of one proton and one neutron) and tritium (which has a nucleus of one proton and two neutrons).

In the early universe, during the first second after the Big Bang, dark protons P_d were also formed leading to dark hydrogen H_d throughout the universe, dark matter.

The term Big Bang is a misnomer as it implies the occurrence of an explosion. However, an explosion implies expansion from a centre point out into the surrounding space. Rather than expanding into space, the Big Bang was the expansion/stretching of space itself, everywhere simultaneously (not from a single point), causing the universe to cool down and the density to be lowered.

Which is what Einstein's equation tells us. Einstein was wrong in that he postulated that the speed of light c was constant, it varies, and so cosmological theories are wrong.

During the first second there was no matter and just energy. So:

$c^2 = e/m = e/0$

And the speed of light was infinite.

You need to know that light is visible energy and invisible energy, energy that is outside the light spectrum, travels at the same speed. I will use the term *light* to mean all energy.

So the expansion of the universe was at the speed of light and, as that was infinite, the universe expanded infinitely in less that a second. Protons and dark protons appeared everywhere simultaneously and about 370,000 years later, during the recombination epoch, hydrogen H and dark hydrogen H_d formed everywhere.

We know this must be the case by observations with telescopes. The furthest galaxies we can detect are about 13 billion light years away. They are uniformly distributed and furthest galaxy to the North must be 26 billion light years away from the furthest galaxy to the South. This is the *event horizon*. The universe has galaxies a lot further away than this, but the light that they emit has not reached us yet.

Matter is attracted to itself by gravity, and so hydrogen molecules clumped together into stars, and the nuclear reactions caused other, heavier elements to be formed and sprayed out into the surrounding space.

In the formula opposite, G is the *universal gravitational constant*. It is positive so that the forces F attract each other.

$$F_1 = F_2 = G\,\frac{m_1 \times m_2}{r^2}$$

Not all energy was transformed into hydrogen and not all dark energy was transformed into dark hydrogen. And thus Einstein's equation should be:

$$e + d = (m_n + m_d)c^2$$

Where e is normal energy, d is dark energy, m_d is normal matter and m_d is dark matter. Dark energy in its simplest formulation is modelled by the cosmological constant term in Einstein field equations of general relativity.

Black holes are formed when the gravitational force is so great that atoms don't exist. Atoms consist of nucleus of protons and neutrons surrounded by electrons and the temperature is above absolute zero, meaning there is energy as well as physical objects. But in black holes there is no atomic structure and protons, neutrons and electrons are compressed together so that there is no energy and particles are at absolute zero. So:

$$c^2 = e/m = 0/m$$

And the speed of light is zero, so we can't see them.
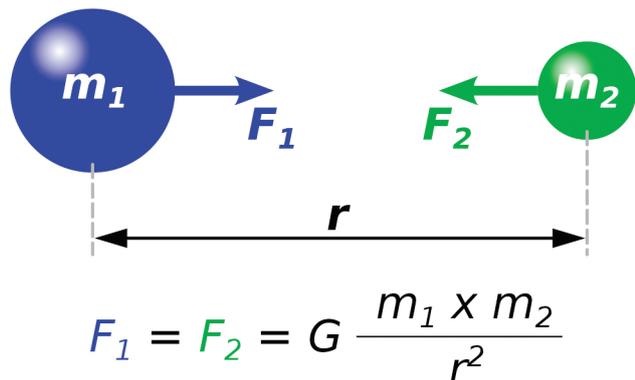
The universe, *as we can see it*, is expanding. There are an infinite number of galaxies outside the event horizon and they exert gravitational forces on the galaxies within the event horizon and so the galaxies we can see are moving away from us.

Why don't we *see* dark hydrogen? Hydrogen can be *seen* throughout the universe by spectral analysis, so why not dark hydrogen?

Dark matter and dark energy are thought to account for approximately 85% of the matter in the universe, Dark matter is called "dark" because it does not appear to interact with the electromagnetic field, which means it does not absorb, reflect, or emit electromagnetic radiation and is, therefore, impossible to detect. It doesn't interact with baryonic matter (normal matter of which we and the Earth are composed) and it's completely invisible to light and other forms of electromagnetic radiation, making dark matter impossible to detect with instruments.

The primary evidence for dark matter comes from calculations showing that many galaxies would behave quite differently if they did not contain a large amount of unseen matter. Some galaxies would not have formed at all and others would not move as they currently do.

Think of dark energy as the "evil counterpart" to gravity, an "anti-gravity" force providing a negative pressure that fills the universe and stretches the very fabric of space-time. As it does so, dark energy drives cosmic objects apart at an increasingly rapid rate rather than drawing them together as gravity does. In the formula G^d is the *universal gravitational repulsion* and it is negative.
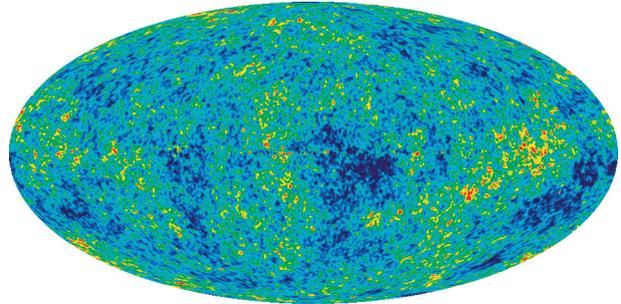

$$F_1^d = F_2^d = G^d \frac{m_1 \times m_2}{r^2}$$
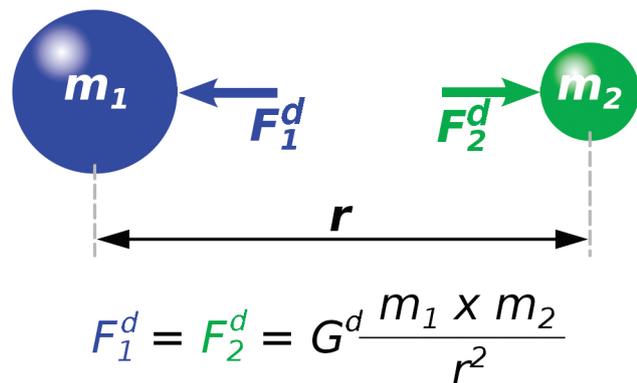
In the standard *Lambda-CDM* (*λ-Cold Dark Matter*) model of cosmology, the total mass-energy content of the universe contains 5% ordinary matter (the matter we know and that makes up all stars and galaxies), 26.8% dark matter, and 68.2% of dark energy, *Lambda*. Thus, dark matter and dark energy constitute 85% of the total mass, while dark energy and dark matter constitute 95% of the total mass-energy content.

Dark energy appears to be associated with the vacuum in space. It is distributed evenly throughout the universe, not only in space but also in time – in other words, its effect is not diluted as the universe expands. The even distribution means that dark energy does not have any local gravitational effects, but rather a global effect on the universe as a whole. This leads to a repulsive force, which tends to accelerate the expansion of the universe. The rate of expansion and its acceleration can be measured

by observations based on Hubble's law. These measurements, together with other scientific data, have confirmed the existence of dark energy and provide an estimate of just how much of this mysterious substance exists.

Black holes contain no dark matter. If they did, because of gravitational repulsion, they would be blown apart as soon as they formed.

There are some postulations to account for dark energy. These include the vacuum energy of space, particles literally popping in and out of existence in empty space, and a "fifth force" responsible for the negative pressure that might cause the accelerated expansion of the universe. Other possibilities are a range of different "flavours" of fields that could account for dark energy

CMB radiation within the event horizon

such as a low-energy field dubbed "quintessence," fields of tachyons, hypothetical particles that travel faster than light and thus back in time. Or it is the mysterious *cosmic microwave background* (CMB) radiation? One idea is that it could contain supersymmetric particles.

All of these remain purely hypothetical, meaning that the only way we can really "know" dark energy currently is via its effect on the universe.

The simplest explanation for dark energy is that it is an intrinsic, fundamental energy of space. This is the cosmological constant, usually represented by the Greek letter λ (Lambda, hence Lambda-CDM model).

You need to be aware of the basic concept of quantum mechanics, that matter and energy are interchangeable, and sometimes energy looks like particles affected by gravity and sometimes particles look like energy. This also applies to dark energy and dark matter. The only distinction is that matter and dark matter remain as particles for a long time and energy only exists as particles for a very short time.

It is not yet understood why the universe has more matter than antimatter. It is generally assumed that when the universe was young and very hot it was in statistical equilibrium and contained equal numbers of baryons and antibaryons. (A baryon is any member of one of two classes of hadrons, particles built from quarks and thus experiencing the strong nuclear force. Baryons are heavy subatomic particles that are made up of three quarks. Both protons and neutrons, as well as other particles, are baryons.)

However, observations suggest that the universe, including its most distant parts, is made almost entirely of normal matter, rather than antimatter.

Transformation Of Mass

In the graph *time* is the horizontal axis and *mass* is the vertical axis. Time zero t_0 is the big bang when there was no mass, just energy. The time t_n is the time now. It is clear from observations that all energy has not been converted into mass so we must be somewhere on the upward curve. The dotted line from t_n to t_x is the predicted curve based on sine waves. The conversion of energy into mass slows down as the available energy becomes sparse and the sine curve mimics this well.
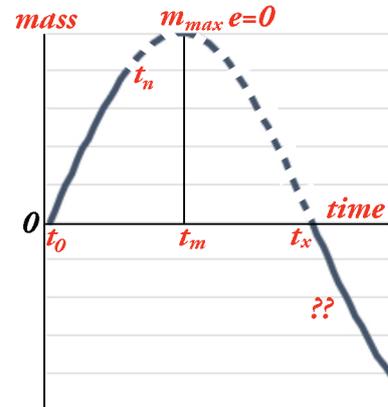
Graph of mass versus time

The point in time t_m is the point of maximum mass and zero energy, and so the temperature is absolute zero. It is the half-life of the universe.

When energy is transformed into particles, potential energy is stored in the particles and some of it is exhibited as gravity.

From t_m to t_x the mass is transformed slowly into energy. This is because gravity and friction make the particles unstable and the total mass becomes smaller and the total energy becomes greater.

The curve labelled ?? is an hypothesis based on smooth mathematical curves, in this case a sine curve.

But t_x is probably a singularity and the curve t_0 to t_x is repeated; thus the universe is created again without a Big Bang. This leads to the possibility that was never a Big Bang, but the universe always was and always is infinite.

Nothing can travel faster than the speed of light, which is about 300,000 kilometres per second (186,000 miles per second). Only *massless* particles, including photons, which make up light, can travel at that speed. It's impossible to accelerate any object up to the speed of light because it would take an infinite amount of energy to do so.

All waves of the electromagnetic spectrum travel at the speed of light. There are seven types of electromagnetic waves: radio waves, microwaves, infrared light, visible light, ultraviolet light, X-rays, and gamma rays.

Are We Alone?

People, including Nikola Tesla, have postulated that intelligent life lives in many places in the universe.

The Earth is about 4.5 billion years old and it took nearly all of that time for intelligent life to evolve. But the industrial revolution was about 250 years ago, the theories of relativity are about 100 years old, and our ideas of the universe date from that time.

It is estimated that there are 100 to 200 billion galaxies within the event horizon and about 2 trillion in total.

Assuming that intelligent life, and in particular *transmitted, electromagnetic signals*, evolved roughly at the same rate throughout the universe, we should look at planets that have the potential to harbour intelligent life. Theoretical work postulating the possibility of carrying signals on radio and microwave bands across vast distances in the galaxy with little interference led to first "listening" experiments in the 1960s.

There is only one planet, Trappist-1e, close to us that may hold intelligent life and it is 40 light years away. Which means any signals which we receive from there were generated 40 years ago. There have been no detected signals from the planet so we can be sure there is no intelligent life on it.

The next closest planets are Kepler 1649c, some 300 light years away, Kepler-186f, 500 light years, and Kepler-22b, 600 light years away.

So any signals we receive from them now *must have transmitted 300, 500 and 600 years ago.*

And the next planet, Kepler-442b, is 1,200 light years from us.

The lack of signals from it means that if intelligent life on Kepler 1649c exists then it must have developed transmitted signals within the last 300 years that have not reached us yet. And if radio signals were developed 300 years ago on Kepler-442b we would have to wait for 900 years for them to reach us!

Our own electromagnetic radiation began about 120 years ago, so the distance travelled by our very first signals is 120 light years. It has reached Trappist-1e but has another 180 years to reach the next planet, Kepler 1649c and the inhabitants (if any) would wait a very long time to discover there was life on Earth. And if they responded by sending a message to us, we would have to wait about 480 years to receive it.

So far the Voyager 1 spacecraft, travelling at 17 km/sec, has taken 35 years to leave our solar System. It travels at 0.000057 the speed of light and will reach the distance of Trappist-1e in about 17,500 years.

Even if we could travel at one-tenth of the speed of light (30,000 km/sec) it would take 400 years to reach Trappist-1e, and the space ship would have to include facilities for a number of generations; food and water, a hospital and school, and a system of energy generation to provide light and power.

The Earth's diameter is 12,756 km and the distance of a light year is about 9.46,000,000,000,000 km. And so the Earth's diameter is about 0.00000000135 of a light year.

The purpose of these mind-boggling figures is put into perspective that we are, in all intents and purposes, alone in the universe.

Nikola Tesla's Ideas

In a 1900 patent, Tesla showed a system for transmitting electrical energy and it uses Tesla Coils. (See the next page.) He patented this two times, in March and May 1900, but it was first published in the *San Francisco Call*, November 13 1898.

What Tesla proposes in this patent is to transmit almost any amount of power almost any distance without wires, and *without loss*.

The transmitter (left) has a large alternating current or intermittent power source *G* which runs through the primary *C* of a Tesla Coil, the secondary *A* runs to a wire *B* to an elevated antenna *D*. The antenna is:

> *preferably of large surface, formed or maintained by such means as a balloon at an elevation suitable for the purpose of transmission, thirty to thirty-five thousand feet above the level of the sea.* (About 7 miles above sea level.)

The receiver *D'*, likewise maintained at the same elevation and which can be many hundreds and even thousands of miles away, has a wire *B'* connected to the secondary of a Tesla Coil and to the primary circuit *C'*.

Tesla only shows a few lamps and motors but obviously the power of the electrical energy transmitted from *D* to *D'* can be far greater:

> *the energy of many thousands of horse-power may be transmitted over vast distances*

To put it in context, a typical house consumes about 30 KW. So Tesla's patent could produce about 3,730 KW and power about 125 houses and about 500 people.

Tesla is quite precise about the source of this energy:

> *It is to be noted that the phenomenon here involved in the transmission of electrical energy is one of true conduction and is not to be confounded with the phenomena of electrical radiation which have heretofore been observed and which from the very nature and mode of propagation would render practically impossible the transmission of any appreciable amount of energy to such distances as are of practical importance. ...*
>
> *It will be readily understood that when the above prescribed relations exist **the best conditions for resonance** between the transmitting and receiving circuits are attained, and owing to the fact that the points of highest potential in the coils or conductors A A' are coincident with the elevated terminals the maximum flow of current will take place in the two coils, and this, further, necessarily implies that t**he capacity and inductance in each of the circuits have such values as to secure the most perfect condition of synchronism with the impressed oscillations.***

The highlighted words make it clear that some sort of tunnel of energy is created between *D* and *D'*, but Tesla does not specify of what it is composed.

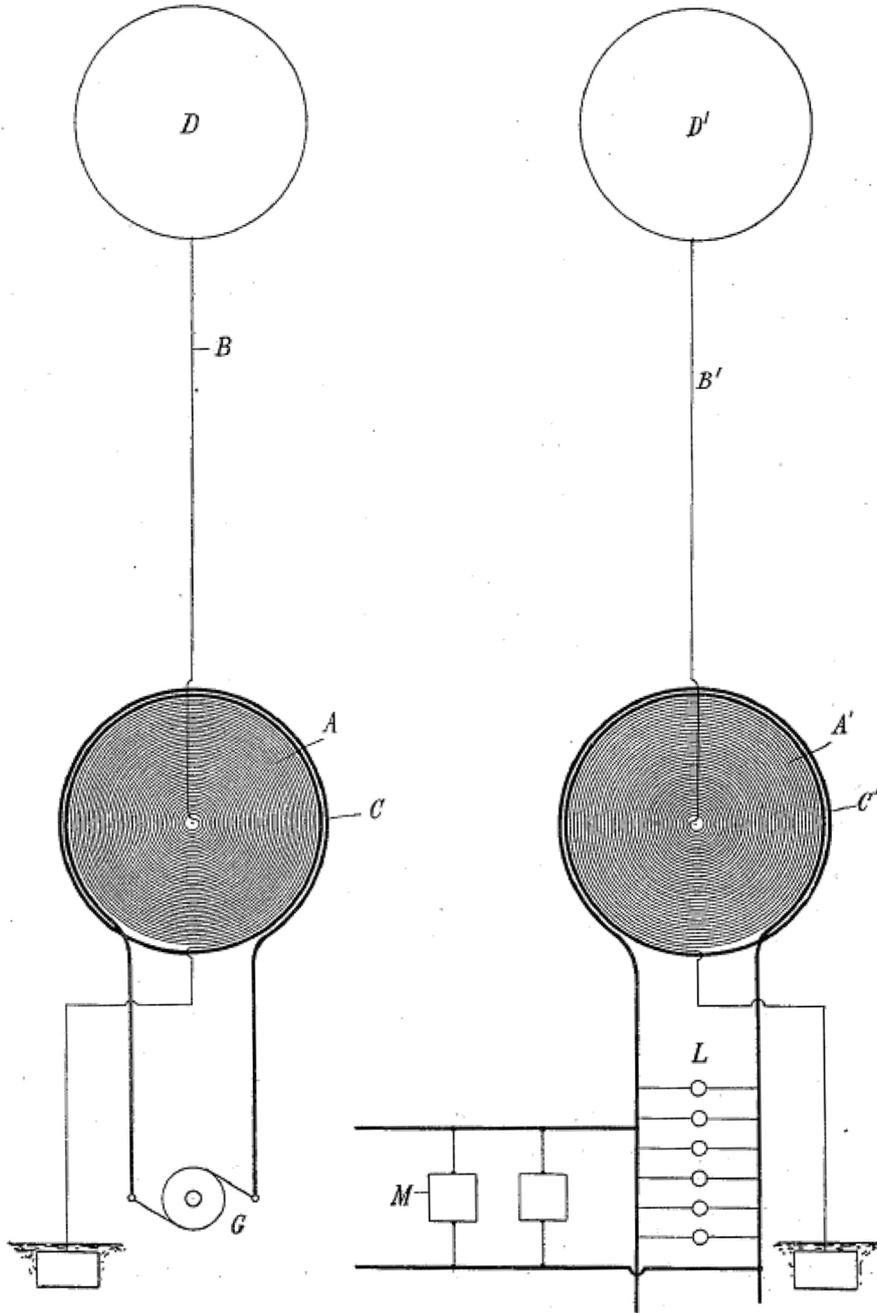Jet aircraft fly between 33,000 and 42,000 feet so the system must be well away from flight paths.

N. TESLA.
APPARATUS FOR TRANSMISSION OF ELECTRICAL ENERGY.
(Application filed Feb. 19, 1900.)

(No Model.)

Witnesses:

Benjamin Miller.

G. W. Marling.

Nikola Tesla, Inventor

by Ken, Page & Cooper

Attys

Using Dark Energy

One use of dark energy is the flying saucer developed in the USA. I was privileged to go on board one flying saucer but I had to sign a secrecy agreement, so I can only write in general terms about it.

It was the result of experiments with the above patent. The scientists replaced the flat antennae by parabolic reflectors and used the system at 10,000 feet. They discovered that the dark energy tunnel created was not rectilinear but was bent around the Earth's surface, and they deduced that the mass of the Earth caused the tunnel to bend. Another experiment on the Moon with two parabolic reflectors against each other but facing in opposite directions created a tunnel that went all the way around the Moon's surface instead of beaming the energy into space. From that they deduced, correctly, that the tunnel effect was a function of the mass *and* the diameter of the body.

They went on to find about the anti-gravity properties of dark energy. The mass of the proposed system means that they couldn't develop models and they started out building a disk large enough to have a mass large enough at its centre composed of the heaviest materials that they could use. Then they designed parabolic reflectors, that could be adjusted in size so that the dark energy tunnel could be controlled, and a generator that would fit in the disk.

The first tests were piloted by an astronaut who was alone, because the disk might explode, and communicated by radio. She closed the parabolic reflectors and started the generator. Then she opened the parabolic reflectors slowly, step by step. Nothing happened at first, but then the disk began to rise up and it hovered as the anti-gravity effect was large enough.

As the experiment was successful, engineers built a larger model with refinements. Most important was that the first disk could only travel vertically. This was solved by using parabolic reflectors that only covered part of the circumference, so that one section could have more power than the others and the disk would fly in the contrary direction.

Flying saucers are disks because of the requirements of the dark energy system. Experiments were done on cigar-shaped flying saucers but, although they flew, disks were much easier to manufacture.