Light and Heat

John Huang
17710 NE 103rd Ct, Redmond WA 98052
e-mail: jh17710@gmail.com

Heat is the most important energy we need. There are two ways to transport heat. One is called radiation and the other one is by contact. However, people should know that both of them are collisions. You may wonder how can we call a soft touch, the contact of a hot iron or fire, a collision? Even an energy radiation, with very fast speed, is not considered a collision. Because we don't think an energy pack has a boundary so that we should name the radiation related activities as absorption and emission, isn't it?

However, if we consider a photon is a particle, then, collision will be a proper word for radiation. My idea is that if one of the collision parties is a photon, then, the collision is named radiation. If both parties in a collision are photons then the collision is related to the transportation of heat but the possibility of that kind of collisions is so tiny that people can ignore it for the time being. When the technology is ready to detect that kind of collision then people can name it and study it. If at least one of two parties in a collision contains atoms then it is the 2nd way of transporting heat and people can measure the temperature of the party with atoms. I don't have a good name for it yet, let me call it "contact" for now. I will explain my definition in more detail.

Light is a pulse or a ray of photons. Light is a wave and photons move along a cycling path. However, if photons have no charge, then people should not say light is electromagnetic wave (EM wave), isn't it? Only if photons have charges, the name of EM wave can make some sense. I will say even if photons have charges, the name of EM wave is still a miss guiding. The main reason is a photon may go to a direction that nothing is before it, but a cycling electronic field makes sense only when there is another photon around that moving photon. Isn't it? Light is the main topic of my paper. I will show you how people misunderstand the light in more detail.

1. Cold and Entropy

If we image closer at the location of a contact between two molecules, think about how electrons at the skin of relative objects are hitting each other at the time of contact, then there are collisions between electrons, isn't it? The party with more excited electrons will cause electrons in the other party be excited, that means be hit and jump up to higher orbits. That is why I said "by contact" is also a collision. If the other party is a photon and the photon hit an electron, then at the contact point, when there is a change to the speeds of both parties, a transfer of kinetic energy occurred at the collision. The electron will change its orbit and the photon will change its frequency at the collision. If the party collides with that photon is a thermometer then depend on electron moves up or down, the reading of the temperature will becomes larger or smaller. Now, don't you think a radiation is also a collision? The actual number people talk about temperature is exactly the temperature of the thermometer, not the temperature of that photon or the object people try to get a temperature reading. An air molecule has internal energy and kinetic energy, but we don't give it a temperature. I think the heat is a character of objects with atoms and when we measure the temperature of that object, we normally get a lower reading from the thermometer.

The way that photons transport heat is actually quite the same as the transportation by contact. Photons are making electrons, at the skin of relative object, excited. If you think the explanation is interesting, then this paper is prepared for you. For heat, I will talk about cold and entropy, then for light, I will tell you my idea of photons and relativities. I will make my idea as simple as possible. For example, the reverse action of transporting heat is transporting cold. It is very clear that to the party giving out heat, it is getting cold in the same incident of collision. That means when one party is giving heat it is getting cold. All air particles sent by one air conditioner can have either hotter skins or colder skins depend on the relative temperature of the room. An air particle with hotter skin has more excited electrons staying at higher orbits and it is ready to contact our skins to warm us up. A particle of colder skin has less excited electrons compared with air particles in the room so that when it touches our skins, electrons in our skin will move more of electrons in that air particle to higher orbits then our skins will cool down. Does this explanation make sense to you? I have more to say in this paper.

One thing related to cold is the idea of entropy, created by Rudolf Clausius in 1865. Earlier in 1665, a Dutch scientist Christian Huygens noticed that if two clocks were placed next to each other, within a very short time they would lock up and tick in perfect synchrony. People did not know why. Clausius found out some of total energy may lose while a system is doing some work on another system. He created the idea of entropy. Entropy is the energy per degree of absolute temperature. If all energies are used to increase the temperature of that system, then, there is no waste-of-energy, the initial entropy and the final entropy will be the same, so that the change of entropy is zero. However, in most natural reactions, the final entropy is larger than the initial entropy within an enclosed system. For example, two iron bars put together in an enclosed box starting at temperatures of T1>T3, the system of the bar with temperature T1 will heat up the other system with iron bar of T3 until both bars will end at T2 and T2. The sum of entropy-differences of above two systems will always be larger than zero for all T1>T3 and equal to zero only when T1=T3, according to the entropy theory. I think, that is because normally, some energies in the higher temperature iron bar will not be used to increase the temperature of the other iron bar just like some energies of an object are not used to warm up the thermometer measuring the temperature of that object so that the measured temperature is normally below the expected or calculated temperature. I think two pendulum clocks at same speed will match their phases can be treated as quite the same entropy theory. But I don't know the detail unless there are no boxes to block the air. In that situation, I will guess the air of different pressures eventually synchronized the pendulums just like the different temperatures even out in the entropy theory.

2. Photons

Among all objects in our universe the smallest one we know is photon. A photon is so small an object that physicists believe its mass is zero. However, a photon has a fixed energy and which is equal to its frequency times a constant. Physicists name the constant as Planck Constant and they use h to represent it. If we use f to represent the frequency and E to represent the energy of a photon then we have E=hf.

I was so deeply attracted by the amazing character of photons that I had been studying and thinking about it again and again. Around the end of year 2007, after I found out the definition of time synchronization by using rays (a group of photons) can be defined more precisely, I started releasing some of my findings about photons. I have discussed with friends in different websites since then. However, my viewpoint is different from all of them, except one.

2.1. A Hope

It is until recently, after I read some words in the comic book, "Four Symphonies of the Oriental Universe" by ZhiZhong Cai published on 2010-9-1, I finally saw a match to my idea about photons. That brought me a real hope. I hope his book can attract enough readers and eventually people will understand photons a little bit more practically.

2.2. A very Different Object

Photon is a miracle of nature. Photon is a very different object so that most physicists understand only part of it. Like a group of blinds try to figure out the shape of an elephant by touching a part of it and making up a decision based on the touch. With so many kinds of evidences I will focus on one magical character of photons and some experiments about the speed of photons in this section, then, I will introduce Laozi's idea about photons.

2.3. About Spin

How do we know if a photon spins clockwise or counterclockwise? What is the relation between the axis of self-spin and the direction of the velocity of a photon? Basically, how a photon moves? Does it move along a sinusoid wave or a spiral path? Actually, a strong / weak cycling moves along a straight line is also possible. That is just another kind of wave. There may be other different kinds of wave formats to match two spins of photons.

2.4. The Wavelength and Frequency

The magical character of photons is about their wavelengths and frequencies. It doesn't matter if a photon moves along a spiral path, a sinusoid wave, or a straight line with strong / weak cycling, or any combination of them, a photon will define a wavelength and a frequency in its motion.

2-4-1. The Magical Character

A photon will change its frequency after exchange momentum with other object. However, at the time of exchange, the wavelength of a photon will change according to its frequency to make sure that the product of them is always equal to c, the constant speed of light. That is the magical character of photons. I don't know how photons make it but physicists have proved it.

2-4-2. The related Effect

The related effect is named Doppler effect. When a group of photons run together, like a pulse (or a ray if continuously), they will line up along the path. Yes, one by one, almost without distance between each other, along the path and make the pulse looks like a solid section of spring or a solid section of sinusoid wave. According to Doppler effect, the speed of a ray, that is the wavelength times frequency of the ray, will remain the same even if the source of the ray or the observer is moving back or forth to each other. What happens is when the frequency of a ray changes according to the moving back or forth to each other, the wavelength of the ray will change respective.

2-4-3. A Secret of the Effect

The Doppler effect has a hidden secret, that is, even the observed frequency will increase when the distance between the source and the observer is decreased, the energy of photons remain the same, what increased is the intensity (or the density) of the pulse. We don't use the energy equation, E=hf, to calculate photon energy within Doppler effect. It is because when we define the frequency of a pulse (or a ray), we use the solid section of wave and count the wave peaks according to the solid wave; not according to the moving photons. When the observer moves away from the source at the speed of c/2, then, the density of the ray, the solid wave, will reduce to ½, the counted wave peaks in one unit of time will reduce to ½ but the frequency of each photon in that ray is the same so that we should not say the energy of a photon is half of its original energy. However, the actual effect of that photon can work on that observer is half compared with if the observer is not moving because the effective speed of that photon relative to the moving observer will reduce to half.

2-4-4. When the Secret has no effect

Unless the distance between the source and the observer remains the same, the actual energy of photons should not be calculated by the observed frequency. Logically speaking, when and only when the distance of the source and the observer keeps the same, then, we can use E=hf to calculate the energy of a photon. That is when the secret has no effect. A straight result of this secret is that when the distance of the source and the observer is a constant then the observed frequency will not change no matter how they move. In that situation the wavelength and the speed of light will not change so that the phase of the wave at the observer's side will remain the same all the time. We will use this result later in this paper.

2.5. Evidence of the Magical Character of Photons and the Doppler Effect

There are a lot of experiments could verify the magical character and the related effect. According to the section 3 of the following website http://www.edu-observatory.org/physics-faq/Relativity/SR/experiments.html, we can see quite a few experiments confirmed that the speed of light is the same under all frequencies people can test. The speed of light is said to be isotropic if it has the same value when measured in any/every direction. The section 3.1 and 3.2 of above link showed some experiments verified that the speed of light is isotropic. The section 3.3 showed same speed of light with a moving source that verified the Doppler effect and the section 3.4 showed same speed of light under different frequencies, verified the magical character of photons. I hope this is good enough for you to believe that the speed of light in the vacuum is a constant, *c*.

2.6. Laozi's Idea about Photons and the Universe

According to the first chapter of DaoDeJing the universe begins from the nameless and the named is the mother of all objects in universe. In the chapter 14, Laozi described the "beginning of the universe" or "the named" in more detail. He said that the tiny object people could not see, the tiny voice people could not hear, and the tiny particle people could not grasp were actually same kind of object and it was the "named". In the chapter 42, Laozi said Dao or "The Way" created the "named", then the "named" developed Yin and Yang. After that, Yin and Yang generated three basic elements and three basic elements constructed the universe. Among all objects we know, as of today, the only candidate of the "named" is "photon". Laozi thought the universe started from one kind of object.

2-6-1. The stationary version of Laozi's universe

We may modify Laozi's idea from the chronological version to a stationary version so that there is no beginning of the universe. That means if right now is time zero, then, there is infinitive long of negative time just like we hope there is infinitive long of future. All objects are built from photons. Photons have two kinds of spins and somehow there are two kinds of charges to match that feature. Two kinds of photons construct electrons and two kinds of quarks. Quarks rebuild into protons and neutrons. As we all know, protons, neutrons and electrons construct atoms so that three objects construct the universe we can see, hear, or grasp. If you like to see some more wild idea about photons, please check out my idea in the next section 2-7; otherwise, you may skip it.

2.7. My Wild Idea about Photons Derived from *DaoDeJing*

First of all, my purpose of studying how photons construct the universe is to avoid the complex standard model. Now, let us find some numbers about photons. The most important one is the mass of a photon.

2-7-1. The Mass of a Photon

Let a photon has frequency of f, with radius of its spiral path Rf, and the speed of that photon is (Vf), then, if the photon runs equal speed along the spiral path, we could follow the Pythagorean theorem to derive (Vf)^2=(c^2)+((6.28(Rf)f)^2). Since most physicist believe that electric force and gravitational force have very little or no influence to photons so that we can assume the energy of that photon is very close to or equal to its kinetic energy, E=hf=(m(Vf)^2)/2. That means 2hf=m(Vf)^2 or for the mass, m=2hf/(Vf)^2. The mass of a photon is a constant value, even under the theory of Special Relativity (SR), because the velocity of a photon is always c and SR is unable to handle the case of v=c. Now let us focus on f=1, that means when the wavelength is c, then since both of m and h are assumed to be constant, from m=2h/(c^2+(6.28(R1))^2) we can derive R1. However, the formula is based on assuming the energy of a photon is its kinetic energy, under the assumption of a photon runs equal speed along the spiral path, we could calculate m by our given R1.

2-7-2. The Reasonable Result

If we let the wavelength equal to the circumference as a regular sinusoid wave so that c=6.28(R1), we will have the most reasonable result that m=h/(c^2), about 7x(10)^(-51)kg. If we let 6.28(R1)>c, then the mass of that photon will reduce, but not a lot. For example, when 6.28(R1)=3c, we have m=1.4x(10)^(-51)kg. However, I cannot find a good reason for a low energy photon to go so big a circle as 3 times of a regular sinusoid wave so that I will say m=1.4x(10)^(-51)kg is the minimum end of the mass of a photon. If the circumference 6.28(R1)<c, then we can easily find the maximum mass of a photon when R1=0 and the maximum mass is m=1.4x(10)^(-50)kg.

2-7-3. The Radius Rf is Unknown, so Far

If we choose R1 to be the most reasonable R1=c/6.28, then, the formula for the radius at frequency f is Rf=(c/6.28)((2f-1)/(f^2))^(1/2). However, for the green light, the radius of its spiral path will be about 3 meters! That means the green light with so big of a radius will have trouble entering our eyes. If we let R1=0, then the formula of Rf is Rf=(c/6.28f)((f-1)^(1/2)). The radius of the spiral path for green light will be still too big, about 2 meters. Up to this point, I have to give up the reasonable relation between radius and speeds based on the assumption of "a photon runs equal speed along the sprial path". I have to ignore the actual length of a spiral path and just focus on the relationship of speeds and frequencies; that is (Vf)^2=2hf/m. I will assume that all possible radiuses are very small. When the frequency is 1 or smaller than 1, the radius is very close to 0 and it can even equal to 0. When the frequency is very large, the radius is very close to 0, but at this time, it will never equal to 0. That means, at some frequency, there is a maximum radius but I don't know how to find that maximum radius and the related frequency. I have to think about it. Right now, I don't have any idea about how radius be changed according to frequencies. All I can say in this section is that both equations of Rf listed above are definitely wrong.

2-7-4. The Speed Cycle of a Photon

The next important character of a photon is the speed cycle of a photon. Since we know that the energy of a photon is not all the same along the path, I must let the speed of a photon running fast and slow per cycle of a wavelength. A photon will start from the lowest speed as c, then, increase to the highest speed of (2(Vf)-c) at the half wavelength; then it will reduce back to the lowest speed of c at the end of the wavelength. That will give the averaged speed of the photon, same as Vf, to fit the requirement of hf=(m(Vf)^2)/2. That also means the minimum speed of a photon is c and the value of its velocity in vacuum is a constant c.

2-7-5. Five Kinds of Forces

The next topic is forces. There are five distinguishable forces. They are derived from three of them and they belong to two categories based on how related objects interact with each other.

2-7-5-1. Three Basic Forces

The most powerful force is kinetic force. Kinetic force is the kind of force that can go to unlimited far away with the same power but it cannot influence any other object without a collision with it. The formula of force, F=ma, is for all kinds of forces. People can see the relationship of kinetic energy Ek=m(v^2)/2 and the force F=ma by integrating the equation F=ma for one unit of distance, from 0 to 1. We can change variables of the integration easily like the distance from 0 to 1 can be changed to the velocity from 0 to v in the integration. However to link a force F=ma with an acceleration "a" to a kinetic force with a velocity "v" is not an easy job. It is hard to describe a kinetic force mathematically. People use momentum, mv, to describe a collision by the conservation of momentum. We know that the momentum is not a force, but that is the best people can do to explain a collision. A force is relative to the acceleration, not the velocity, period. If you like to see more detail, my point is, since a kinetic force only applies to an object at the moment of collision so that the change to speeds of both objects happens instantly, that makes it looks like no acceleration period at all. That means a kinetic force is a force without a clear acceleration period and people need a higher technology to investigate the moment of collision when tools are ready. Before that time comes, the kinetic force remains puzzling to people. Now let me introduce the less powerful force. That is the electric force. People think the electric force relative to a single charge exists everywhere. There are three kinds of electric forces. They are the repulsive force between two negative charges, the repulsive force between two positive charges, and the attractive force between different kinds of charges. The weakest force is the gravitational force. It is the attractive force between any pair of photons. If photons are charged, then, we don't need gravitational force; it can be the difference between the stronger attractive force and the weaker repulsive force.

2-7-5-2. Two more Forces

When there is a boundary enclosing a portion of space, the kinetic force is divided into two parts and kinetic force will try to break the boundary. If the boundary is strong enough to keep in one piece under the influence of collisions from kinetic forces of both sides, there may exist a new distinguishable force we name it pressure. A pressure force comes from the higher kinetic force side to the lower kinetic force side. Pressure forces always work on their relative boundaries. If the electrons within a matter are polarized, then there exist a new distinguishable force. We name it the magnetic force.

2-7-5-3. The Power of Force

All forces act only by collision will maintain the power of force until the next collision. All forces act without collision will reduce its power when the other party is farther away and the power of force is decreasing according to the inverse of the square of the distance between two parties.

2-7-6. Energies

Energy is an ability to work. The ability to work is an ability to move other objects. However, some work does not move the whole object, it just moves some electrons of an object so that the work is done but it is hard for people to detect the movement.

2-7-6-1. Heat as a kinetic force

Heat energy is related to the work I just mentioned about. It is the most common energy we need and is formally named as the thermal energy. Thermal energy is the kind of kinetic energy that caused by collisions of other parties. For example, when photons with higher frequencies hit electrons in the object and move them to higher orbits, photons will reduce frequencies after that collision. The object then acquires thermal energy, which is the potency that its excited electrons may drop back to lower orbits and hit other photons from lower frequencies to higher frequencies then leave the object to spread heat. Because the related force is named heat force or just "heat" so that people do not know it is actually a kinetic force carrying by photons or electrons. About kinetic energy, not only photons, any moving object has kinetic energy and its kinetic energy is equal to m(v^2)/2. Kinetic energy is one of two kinds of mechanical energies.

2-7-6-2. Mechanical Energies

The other kind of mechanical energy is elastic potential energy, like the change of shape to a spring or to a rubber band. The elastic potential energy is named by its ability to move other objects. All three kinds of forces are related to the elastic potential energy in a very complicated way. However, it is not as complicated as chemical energy and don't mention about the one extremely hard to understand, the nuclear energy. People still have long way to go in exploiting energies. The pressure energy is related to the kinetic energy because the pressure force is one kind of kinetic forces.

2-7-7. Other Potential energies

Besides the elastic potential energy there are other potential energies. The potential energy relates to gravitational force is gravitational potential energy and relates to electric force is electrostatic potential energy. In case of magnetic force, we name the related energy as magnetic potential energy. All three potential energies introduced here, in this section, are existed in their relative force fields. Just like all movable objects sitting on the earth that they acquired gravitational potential energy through the support of ground, to acquire the other two potential energies, two objects also need some third party objects to hold them on to maintain the distance between the two objects. Otherwise, in a force field, above two objects will be moved by the force in the field and the potential energy between them will reduce accordingly. I will stop my wild idea right here, because I have nothing new to say about my wild idea.

2.8. Back to Real World of Photons

Now, let us go back to our real world. We don't have any evidence for the relation of photons and neutrinos. We don't know how charges stay on an object like an electron, a down quark or an up quark. Charges may be built into objects too. There is no picture of an electron, a down quark or an up quark so that we definitely do not know what is a charge looks like. Hence, we don't know what is the difference between a positive charge and a negative charge. We are not sure if a photon has a mass. We certainly don't know if a charge has a mass or not. They are all too tiny to see. When Laozi said the universe started from the "nameless", he meant, nobody knew and nothing could be said about the "beginning" so that it was the elusive, the "nameless". Now, let us focus on what we do know so that we can find something useful for us, for all human beings, from the real world.

2.9. Space and Time

Ignoring all above questions and imagination about photons, just base on known facts of photons, I will try to answer the following question. Do you think space and time should be absolute as what Newton thought or they should be relative as Einstein claimed? Newton thought that everything is in one space and sharing same time, but Einstein did not agree to Newton's idea. Let me describe the Relative space and time that Einstein believed, very briefly, in the following section.

3. Relative Space and Time

According to the Special Relativity (SR) created by Einstein in 1905, if everything otherwise is the same, then the time in a moving frame runs slower than the time of the observer's frame, assumed that the observer's frame is stationary; and it is true for any observer in the universe. That means, in Einstein's idea, every observer has the fastest time compared with times in all other frames with same kind of environment. The SR is just one kind of relative time.

3.1. Relative Event Period

Ten years after SR was born, Einstein created General Relativity (GR). According to GR, if everything otherwise is the same, then, the time within a stronger gravity field runs slower. Both of SR and GR will apply to an event together. The time period of the event (or the event period) as recorded in the moving system can be calculated from the event period recorded in the stationary system by applying formulas of SR and GR separately to get each difference then combine the differences and attach the result of the combination to the event period recorded by the observer in the stationary system. That procedure assumes SR and GR will influence the time independently.

3-1-1. Two Relative Time Theories

Now, we actually have two kinds of relative time. Most people think SR is included within GR like Newton's theories about motion are included within SR. Others think SR is an approximate format of GR for the situation when gravitational force is the same, like in a small area. But I don't think it is true. I have two reasons.

3-1-2. My two reasons about SR is not within GR

The first one is what we have just learned in section 3-1. For example, like in GPS system, people have to adjust time based on SR and GR separately then combine the results. If GR include SR and is more accurate than SR, why don't we just use GR to adjust GPS system? My second reason is from the equation (72) of Einstein's paper, The Foundation of the General Theory of Relativity, published in 1916. That equation (72) stated d(ct)=1-(gravitational potential); that means, when the gravitational potential is equal to 1 unit, then, the time is not moving. That also imply at the distance closer to the huge mass, when the gravitational potential is larger than 1 unit, the time will reverse, go backward to the history. That is new to SR. Based on the time equation of SR the slowest speed of time can close to zero but always greater than zero. That means, if two relatively moving systems are in an environment with gravitational potential of 2 units, then, they will measure negative time speed and that is against to the time equation of SR.

3.2. Relative Space

About the space, in Einstein's idea, each frame with its own time is a relative space and all relative spaces are equal. Einstein's space and time is too complicated to general public so that I have arranged an easy way to explain space and time by some selected very simple logic.

3.3. Logic

My principle of logic is "to find the main one". One way to expand that principle was provided by Zengzi. He said that "For an object, find the root of it; for a subject, find the key point of it; and for an event, figure out the main cause of why it started and the most likely result it will end, then, we have better possibility to get the best next step based on above findings." So, let me try to locate the root, or, the most important part of photons.

3.4. The Main Known Property of Photons

According to experimental evidences I mentioned in section 2-5, one thing about photons is well established. That is, photons have same speed in vacuum. Let me name that property as SSIV from "Same Speed In Vacuum". If we let c to represent the speed of photons in vacuum and select a wavelength L then a photon with wavelength L will always have the same frequency of c/L if measured in vacuum. I think SSIV is the main known property of photons. My reason is very simple and clear, because the solution of time and space is relying on SSIV. Yes, people need SSIV to understand time and space.

3.5. Rays and Absolute Time Interval

Let me explain time first. There are two aspects of time, one is the speed of time and another one is the time point (TP). For TP, I mean the time an event occurs, like a point in the time line. When we try to synchronize two clocks, we try to match both aspects of two clocks, same speed and same TP. Since the relative time is focusing on the speed, let me deal with speed of time and ignore the TP for now. I will assume that we have some way to match the TP for two clocks when we need it.

3-5-1. The apparatus

The apparatus we need to show the conflict between SSIV and SR/GR is a vacuum box. We need to count the number of wave peaks for a ray of fixed wavelength L, in the box. We need two of the same kind of apparatuses. I also think it is time to explain a ray in more detail.

3-5-2. Rays

A ray is not just a group of photons. All photons in a ray must be emitted from a same source and all photons in a ray must point to one same direction. In actual world, a ray from a flashlight is different from above definition of a single ray. The main portion of the ray from flashlight is made from all parallel rays emitted from the back sphere of the light bulb. Since all photons in a single ray have same wavelength L, the ray itself will have exactly the same wavelength L as well. Even the main body of the ray from flashlight can have the same wavelength L so that they can make a plane wave. That is how amazing photons are.

3-5-3. SR

Now, let us put one of two vacuum boxes at North Pole and the other one at Equator with same gravitational strength of sea level and controlled same temperature. According to SR, the time at Equator runs slower, so that two rays with same wavelength L will have different wave peaks counts in one second as Fn for North Pole and as Fe for Equator, Fe>Fn. Since two rays have same wavelength, calculate from Fe>Fn, we will conclude that the speed of the ray at Equator is faster than the speed of the ray at North Pole, all measured in vacuum with same temperature and same gravitational strength. That will be a clear conflict between SSIV and SR.

3-5-4. SR with Ruler Contraction

If we consider ruler contraction at Equator, that will actually increase the speed of the ray at Equator because the ray will go extra mileage within one second. The conflict between SSIV and SR will actually worsen.

3-5-5. GR

Then, we move the apparatus at North Pole to somewhere at mountainside on Tropic of Cancer with same distance from the axis of spin as the one at Equator so that they will have same speed but different gravity strengths. This time we will have the new wave peaks count in one second, Ft, at mountainside. According to GR, we have Fe>Ft. Now, with the same argument, according to GR, the speed of the ray at the seashore on Equator is faster than the ray at that mountainside on Tropic of Cancer both measured in vacuum, so that GR is conflict to SSIV.

3-5-6. Absolute Time Interval

When I saw ZhiZhong Cai's idea to count the wave peaks number of a ray with fixed wavelength to get standard time interval, I immediately linked it to my ideas listed above. Let the wavelength is L and the wave peaks count in vacuum is F then the time interval is t2-t1=FL/c. Yes, that is a brilliant idea! Instead of let GR conflict to SSIV, we should define the speed of time at sea level as standard time, by FeL/c, and adjust the atomic clock at mountainside according to the difference of Ft and Fe. That means, no matter where we put the apparatus, FL/c is the defined standard time interval (TI).

3-5-6-1. SR and Absolute TI

If the wave peaks count at North Pole, Fn, is less than Fe, we should adjust the speed of atomic clock at North Pole, because it is more practical to assign the speed of time at Equator as standard time speed. However, I think Fn and Fe may be the same.

3-5-6-2. TI Formula (F2-F1)L/c

Since in the apparatus, the distance between the source of the ray and the counting device is assumed fixed, no matter where we put the apparatus and no matter how fast the apparatus is moving, the wave length of the ray as detected by the counting device is always L, and the speed of the ray is always c in the vacuum, so that the TI between larger number F2 and the earlier number F1 is always equal to (F2-F1)L/c. That is the TI formula.

3.6. Photons and Absolute Space

According to ZhiZhong Cai, when a point source of photons, like a tiny light bulb, emits photons just once; theoretically speaking, there will be an expanding ball of photons, with lower density, dimmer light; or fewer photons per unit area, when the radius is getting larger. Mr. Cai said if we can see that expanding ball of photons, then, the center point is a rest point of the whole universe. The expanding ball of photons is the most common way people see photons emitted from their sources, like sun or a light bulb. Another common way people can experience is an expanding cylinder of photons emitted from a light tube. Actually, people see more photons reflected from objects than photons emitted from sources. Now, let us study Mr. Cai's idea.

3-6-1. Absolute Space

If we let the source of light to emit twice each second, then, depend on where the source of light moves, the inner expanding balls may move toward some point on the first expanding ball faster than the opposite point of it. If the inner expanding balls are all keeping the same center point, then, for that period of time, the point source of light is a rest point of the whole universe. However, we don't have any practical way to see the expanding ball of photons in vacuum yet. Yes, to locate a rest point in the whole universe we should limit our observation to a vacuum setting, otherwise, air particles will change directions of photons.

3.7. Distances and Absolute Time Point (TP)

The character of photons that I love the most is their constant velocity. They are the only object in the whole universe can keep a constant velocity. In the environment full of all kinds of forces, it is no way for other object to avoid acceleration. I believe that photons can keep their constant velocities. I think, gravity does not change their directions of moving. Let me assume that is true and tell you what will happen if it is true.

3-7-1. Distance Equation

It is based on above character of photons that human beings can tell the distance of an object. Let me hold an ruler 1 foot away from my eyes to measure a ball of radius r feet and locates at a distance of L feet away from me, L>2r+1. Then we have an equation to calculate the measured radius of that ball as R, R=r/L. If we move the ball to another unknown distance L', and measured the radius of the ball as R', then the distance L' can be calculated as L'=LR/R' ---(1). I named this equation (1), the distance equation of Far Ball Contraction. Yes, the contraction of radius is just a visual effect.

3-7-2. Visual Event Time (VET)

Now, I will show you a hidden property of photons. Let me use TP to represent time point of an event, the time an event happens. Because I used TI to represent time interval so that I hope TP is an acceptable abbreviation. An event time is normally a TP, but some times it can mean TI so that I introduce TP and I will use it when event time can be TI or TP. I am ready to talk about the hidden property, the Visual Event Time (VET).

3-7-2-1. Formula of VET

I have mentioned about the speed of time can be measured by future clocks if we find some way to count wave peaks, then, everyone can use that kind of future clock to measure the absolute time interval (TI). How about the second aspect of synchronizing time, the TP? If an event eA happens at point A, at event time tA, and I locate at point O, then what will be the visual event time (VET) I will measure for the same event eA? We assume all clocks are synchronized for both of same speed and same TP then VET, ta=tA+(AO/c′) ---(2), c′ is the speed of light in that area. The equation (2) is the formula of VET and it is the hidden property of photons.

3-7-3. Visual time interval

If event eA is not an individual event, like a competition of 100 meter race with starting event time and ending event time, so that it will end at a point B and at an event time tB. In my camcorder, the VET of the event ending will be tb=tB+(BO/c'), so that the visual time interval will be (tb-ta)=(tB-tA)+((BO-AO)/c') ---(3). Now we can see something SR tried to tell us, the measured (or visual) event interval, (tb-ta), is not always the same as the actual event interval, (tB-tA). If event eA ends at a location on the sphere with the center point O of radius AO, then BO-AO=0, two event intervals are equal. If B is inside the sphere, then, the visual event period is shorter than the actual event period; if B is outside the sphere then the visual event period is longer than the actual event period. This is the first extended hidden property of photons.

3-7-4. Visual relativity and visual speed

If A, B and O are on one line, and the event is simply the motion of an object starting at point A, under constant speed of v, ending at point B; then we have BO-AO=AB or -AB so that |BO-AO|=(tB-tA)v.

3-7-4-1. Distance Relativity (DR)

We can easily derive the equation of Distance Relativity from (3). When the object moves away from the observer, BO>AO, (tB-tA)=(c'/(c'+v))(tb-ta) ---(4) and when the object moves toward to the observer, BO<AO, (tB-tA)=(c'/(c'-v))(tb-ta) ---(5). We can adopt the symbols of SR, let tB-tA=t' and tb-ta=t, then when the object moves away, t'=(c'/(c'+v))t ---(6) and when the object is incoming, t'=(c'/(c'-v))t ---(7). I name equations (6) and (7) as Distance Relativity (DR). DR is the second extended hidden property of photons. When an object moves away from the observer, the time speed in the moving system looks like slower than the rest system; however, when the object comes close to the observer, the time speed in the moving system looks faster than the rest system. This is totally different from SR.

3-7-4-2. Equations of Visual Speeds

The visual speed of that object moving from A to B can be calculated by V=AB/(tb-ta)=t'v/t=(t'/t)v. According to DR, when the object moves away, from equation (6) we have V=(c'/(c'+v))v ---(8) and when the object is incoming, from equation (7) we will have V=(c'/(c'-v))v ---(9). Equations (8) and (9) are named Equations of Visual Speed. Visual speed is the third extended hidden property of photons.

3-7-4-3. Unlimited Visual Speed

From equation (9), if the speed of the object is v=c'/2, then, V=c'. The visual speed of that object is faster than its actual speed. You may already find out that when the speed of that object is approaching c', then, its visual speed is approaching unlimited fast. Yes, when v=0.999c', then, V=999c'.

3-7-4-4. Photons Run into Our Eyes

If the object flying to us is a photon then the visual speed of that photon will be calculated as unlimited fast. That means, our brains will tell us that photons actually run into our eyes at unlimited fast speed. That will explain why a very clear view will appear at the moment we open our eyes instantly, immediately, and so wonderfully.

4. The First Tragedy

There are two tragedies happened in Physics a little bit longer than 100 years ago. The causes of two tragedies are quite the same, careless. I believe that physicists should be more careful in the future to prevent same kind of tragedy to occur again.

4.1. Michelson-Morley eXperiment (MMX)

There are two minor hidden properties of photons that some people have misunderstanding about them. After we understand more of the properties of photons we will be able to see the tragedy of MMX very clearly.

4.2. A Photon

Some people think, if a person named Mr. E let a source emits a photon upward to the ceiling of a train running at speed of v and receive the reflected photon at the table he emitted the same photon, then to an observer at the ground, outside the train, the photon will appear as running along a path of ^ shape.

That is not true. Most experiments about the speed of light have verified that the velocity of light is independent from the velocity of the source of light; so that when the source emitted a photon upward, the photon will not go upward relative to the train. It is not like pitching a baseball. A baseball will go upward relative to the observer on the train; and to the observer at ground, that baseball will reflect to the table along a path of a ^ shape as expected. However, a photon will go upward relative to the rest universe and reflect to a point at the horizontal level of the table, but behind the emitting point. That means the route of the photon will be, most likely, up and down if the observer at ground can see it.

4.3. A Ray

A ray of photons is more complicated than an expanding ball of thinning out photons as I mentioned about in section 3-6. The source of a ray can move or spin and the visual speed of a ray is even more complicated than the VS can explain, because in VS we have to limit the relation of the source of light and the observer; they must move on one line and under a constant speed v. If we let the source of light to move out of the line and also allow the direction of the ray to turn, then the actual way all photons can go is certainly beyond my imagination. Just for example, if there is a huge cylinder wall around the earth with radius of one light year and you turn a ray at the North Pole, above your head, 360 degree in one second, shining the ray to the cylinder, then theoretically, photons of the ray will reach the cylinder one year later, and as you expected, the speed of the ray, if calculated logically, will take one second to run through the big circle of that cylinder, that is more than 6.283 light year per second. That means, the speed of a ray is not like the speed of a photon, it is the speed of a group of photons. When you emit photons to different directions, the speed of a ray can easily go faster than 198140688 times of the speed of a photon as in the above sample.

4.4. MMX

In MMX, they tried to compare the speed of two rays split from one incident ray. The speed of a ray can be very confusing if the source of ray and the observer have relative motion, including spin, as we understand from last section, 4-3, so that the first thing I will ask you to investigate into MMX is the actual motion relationship between the source of the incident ray and the detector. Do you see any motion or spinning? I think the answer is no. Now we are ready to find the answer for MMX. Let us go section by section.

4-4-1. The First Section

The first section is from the source to the semi-silvered mirror (SSM). Based on the principle of Doppler Effects in the section 2-4-4, the phase of the ray will not change at the end of the first segment, SSM, no matter how the apparatus moves. The frequency and wavelength will not change as well.

4-4-2. The Second Section

The second section is from SSM to the first mirror, M1 or the second mirror, M2. The wavelength and the frequency of both rays will be the same at M1 and M2, as Lm and c/Lm for the same reason that they are all relatively stationary to each other. The phase at M1 may be different from the phase at M2 but each of them will remain the same.

4-4-3. The third and fourth sections

From M1 or M2 back to SSM is the third section and from SSM to the detector is the fourth section. The wavelength and the frequency of both rays will be the same as Lm and c/Lm for the same reason that they are all relatively stationary to each other. The phase at M1 and M2 may be different but when two rays back to SSM, their phases will be the same again. At beginning of the experiment, the physicist would have adjusted the location of M1 and M2 to let the detector receive same phase from two rays.

4-4-4. The first step of the experiment

Let me explain it in more detail. We know that the distance between the source, SSM, M1, M2, and the detector are all fixed numbers, if the ray goes to M1 takes total time of T1 to complete the trip and the ray goes to M2 takes total time of T2 to complete the trip, then, we know that the difference between T1 and T2 is zero or nLm/c, for some natural number n and the wavelength Lm, because the first step of this experiment is to make sure that two rays reach the detector at same phase of their waves.

4-4-5. The expected results

Now, we have two kinds of expected results. If the actual distance between devices will not change at the direction of motion, based on the same wavelength Lm and frequency c/Lm, T1 and T2 will remain the same. That means, if no "ruler contraction" then we expect null result. If the distance of each pair of devices will change at the direction of motion then, based on the same wavelength Lm and frequency c/Lm, we expect T1 and T2 will change. If there is "ruler contraction" then we expect some change in MMX.

4-4-6. The verified result

In MMX, before they turn the apparatus they had adjusted the distance between SSM and M1/M2 to make sure the distances are the same, so that the time spent by both rays are the same, T1=T2. According to Websites, most MMX experiments showed T1=T2 within the experiment errors.

4-4-7. The sad history

However, most physicists ignored the fact that the source of light is relatively stationary with mirrors and the detector. They assumed mirrors and the detector were moving relatively to the source of ray so that the time spent on two routes were expected to change according to the velocity of the apparatus. Now, do you see the tragedy of MMX? Most physicists who have reviewed MMX are expecting change of traveling time between two rays, but as we just analyzed in this section, there should be no difference. It is sad that so many physicists have spent so much of time and efforts to work on MMX and it turns out, MMX is just a misunderstanding of rays.

5. The Second Tragedy

The second tragedy is the Lorentz Transformation (LT). Tried to solve the paradox of null result in MMX, Lorentz created a hypothesis of "ruler contraction" that states "the ruler will contract at the direction of motion". The contraction will cause the measurement of length along the direction of motion to extend under the rate of Lorentz Factor. Normally, in the textbooks of physics, the Lorentz Factor is represented by the Greek alphabet letter, gamma, but I will use k to make my typing easier in this paper.

5.1. LT

LT is based on the setting of Galilean Transformation (GT). Two Cartesian coordinate systems S and S' with origin points O and O' have all positive directions of axes point to the same direction respectively and the x axis is on the same line as the x' axis except there is a constant speed between them. S' is moving at a speed of v toward positive x direction relative to S. In GT, the author also let the time in S, t, and the time in S', t', be the same as t'=t=0 when O' meets O. That means before O' meets O both of t' and t are negative. Then GT states if an event eA happens at time tA, location A, is recorded by observers in S as (t,x,y,z) and by observers in S' by (t',x',y',z') we will have t'=t, x'=x-vt, y'=y and z'=z. Lorentz said let x'=k(x-vt) ---(10).

5.2. The Derivation of LT

Since the inverse LT will provide another spatial equation, x=k(x'+vt') ---(11), Lorentz just combined (10) and (11) to get a strange time equation t'=k(t-(vx/c^2)) ---(12), c^2 means the square of the speed of light in vacuum. That is how he established his LT. From (10) and (11), he could also derive the time equation t=k(t'+(vx'/c^2)) ---(13) for inverse LT.

5.3. LT and Inversed LT

Assumed "ruler contraction", under the setting of GT, LT claims t'=k(t-(vx/c^2)), x'=k(x-vt), y'=y and z'=z. Inverse LT claims t=k(t'+(vx'/c^2)), x=k(x'+vt'), y=y' and z=z'.

5.4. More Restriction on LT

For all equations (10), (11), (12) and (13) to coexist, the variables must satisfy the conditions for both of LT and inverse LT. It is not easy to see clearly just by thinking about what is the problem for both of {S' is moving at v, S is rest,} and {S is moving at -v, S' is rest,} to coexist. But, if I show you that there is a missing time equation in LT you will be able to see the restriction of their variables very clearly, not just by imagination.

5.5. The Missing Time Equation in LT

Let B(b,0,0) be a point in S and b<0. Let observers in S measure the time O' meets B be t and measure the distance of B and O be BO, then, since when O' meets O we have t=0, BO=|v|(0-t)= -vt. Let observers in S' measure the time O' meets B be t', then they can calculate the distance of B and O as measured by S' by (BO)'=|-v|(0-t')= -vt'. Now, we can apply "ruler contraction" to BO and (BO)' to get (BO)'=k(BO), -vt'=k(-vt), so that t'=kt. That means, when O' meets B, t'=kt. For b>0, B is on the positive side of the x-axis, let O' move from O to B. Following quite the same procedure, we can derive t'=kt when O' meets B. For b=0, we have t=t=0, so that t'=kt is also true when O' meets B. Combine above 3 conditions, we derive the result that for all possible location of O', t'=kt ---(14) is always true. That time equation (14) is the missing equation in LT.

5.6. LT is Correct

This time let us look into the spatial equation in LT, that is x'=k(x-vt). Before O' meets O, we have x'-OO'=x; after O' meets O we have x'+OO'=x; for observers in S', the length of OO' is OO'=v|t'| so that we have x'+vt'=x. Now, we may apply "ruler contraction" to the same section measured in S' and S by x'+vt'=kx. The original spatial equation in LT should be x'=kx-vt' ---(15). With help of equation (14), the equation (15) will then change to equation (10) in LT. When Lorentz started from spatial equation (10), he was correct by pure luck.

5.7. The Tragedy is Sad

LT is correct but after we know the missing time equation in LT, we also know that t=kt' is the missing time equation in inverse LT. For LT and inverse LT to coexist, the missing equations t'=kt and t=kt' will also coexist. Do you see the restriction of variables now? For t'=kt and t=kt' to coexist, we must have k^2=1. Since k>1 when c>v>0, we have k>0, so that the restriction is "for LT and inverse LT to coexist we must have k=1". When k=1, v must be zero. LT is correct mathematically but useless physically because LT is correct only when v=0. It is a very sad tragedy that so many physicists have spent so much time on LT and all of LT related applications for so long of time.

6. A Mess in Physics

Now comes the time for something confusing. I don't know how physicists measure the time in a moving system S', but, most physicists believe that SR is experimentally proved. I don't know how they compare the time intervals measured by observers in S and S'. How do they let observers in two systems communicate with each other? To me, it is a magician's performance. I always enjoy smart performance of magicians but not this one. When SR expanded to GR, the way physicists prove GR is even more fancy. What I will provide here is just some minor problems I know. Since both of SR and GR are against to SSIV, if we like to keep SSIV then we must give up SR and GR. I think we should put SR and GR into history of physics and start to think about the Distance Relativity (DR).

6.1. 1905-6-30

On his paper published 1905-6-30, Einstein claimed that he proved LT. Actually in the section 3, his equation (t0+t2)/2 = t1 is not true. It should be an inequality (t0+t2)/2 < t1. Why? Because his definition of synchronization in section 1 is for two clocks in one rest system, when he applied it in section 3, the scenario is two inertial systems where the receiving point is different from the emitting point. To expand his definition of synchronization for clocks in two inertial systems or for more general situation we must add one more condition to his definition. Let me explain it.

6-1-1. Definition of Synchronization

Einstein defined that, let a ray emit from clock A at point E, time t0, to clock B; reach clock B at point R, time t1, and reflect back to clock A, arrive at point F, time t2; then if all of following 3 conditions are fulfilled we define clock A and clock B are synchronized. 1.) Clock A and clock B are same model. 2.) Speeds of the clock A and the clock B are the same. 3.) (t0+t2)/2 = t1.

6-1-2. RF=RE

When clock A is moving, we need to know if RF=RE, because if distances RF and RE are different then we may have trouble. If we have only one system and clock A is rest in the system, then we can assume the system is rest and Einstein's definition of synchronization is fine. But if clock A moves and causes RF to become longer or shorter than RE, then the time for a ray to go through RF and RE will be different so that t1 will not be the average of the times t0 and t2. If RF>RE, t1 is smaller than the average and if RF<RE, t1 is larger than the average.

6-1-3. LT Was not Proved

In the section 3 of Einstein's 1905-6-30, there were two systems and it was RF<RE so that the actual relation of t0, t1, and t2 was (t0+t2)/2 < t1, not the equation. Einstein would not prove LT follow the correct inequality.

6.2. Appendix I, 1920

In appendix I of his book "Relativity, The Special and General Theory" published by New York, Henry Holt, 1920; Einstein provided a "Simple Derivation of the Lorentz Transformation". There were two issues in his proof of LT.

6-2-1. From (1) and (2) to (3)

There is a relation between (1) and (2), that is "(1) <=> (2)". Which means when (1) is correct then (2) must be correct and vice versa. However when Einstein stated "Those space-time points (events) which satisfy (1) must also satisfy (2). Obviously this will be the case when the relation (3) is fulfilled in general ... for, according to (3), the disappearance of (x-ct) involve the disappearance of (x'-ct')." he was logically wrong. Logically speaking, if the constant is not zero, then (3) will imply "(1) <=> (2)"; but "(1) <=> (2)" will not imply (3). For example, (x-ct)^2 = x'-ct' satisfies "(1) <=> (2)" but it is not one of (3), so, "(1) <=> (2)" will not imply (3). However, this issue is not a real problem.

6-2-2. From (3) and (4) to (5)

When Einstein combined equations (3) and (4) together, he did have right to do so. However, when the mathematical rules for variables applied to his action, we will find out what he did to LT is quite the same as what Lorentz did to LT. Both of them had reduced the variables domain for LT to useless situation. The variables domain for (3) is x and x' must be zero or a positive number, because t and t' are zero or positive numbers. The variables domain for (4) is x and x' must be zero or a negative number, because t and t' are zero or positive numbers. When Einstein combined (3) and (4), the valid variables domain for (3) and (4) to coexist is the intersection of the respective domains of (3) and (4), that means, when x and x' are zero. What Einstein had proved in this appendix is actually that "when x and x' are zero, LT is correct". That kind of LT is physically useless. It is even worse than what Lorentz had created, that is "when v=0, LT is correct".

6.3. Twin Paradox

The most famous paradox in SR is the Twin Paradox. Here is how Mr. Cai explains it. In his book published 9-1-2010, ZhiZhong Cai let a football game be broadcasting by AM waves at frequency of F and the twin brother B go 0.8c speed away from earth. In the leaving path, B will receive 20% of information so that the TV will show very slow motion of the front 20% portion of the broadcast and the remainder 80%, as well as the 100% section of the returning path, will show fast motion on TV so that when B meets A, B has watched the exactly same broadcast as A has watched, but in two kinds of motion-speeds. That is another way to explain Twin Paradox.

6.4. Clock Paradox

Here is a clock paradox quite the same as Dr. Herbert Dingle's argument. Let digital clock A and clock B are same model and have same speed. We let both clocks run circle at same speed of v with opposite direction, clockwise and counterclockwise, on two circles in one plane with same radius and with the closest points 5 inches apart so that each time two clocks meet at their closest points two observers go with clocks and one observer rest on the plane can all see both clock clearly at the same time. Now, what will happen to the numbers show on two clocks if they are digital clocks? According to SR, observers move with clock A should see clock B is slower each time they meet, observers move with clock B should see clock A is slower each time they meet, and observers rest on plane should see same time speed each time they meet. How can that be true?

7. Derivations of SR

There are at least 3 ways to derive SR.

7.1. The Original One

The original one is the one introduced on 1905-6-30. That one is based on LT so that it is good only when v=0. The SR derived by LT is useless.

7.2. The Most Common One

The most common one is based on the postulate of "The speed of light is independent of the speed of source and observers." The proof let a ray be emitted from a table in a train running at constant velocity v, upward and be reflected by a mirror on the ceiling then back to table. If the distance between the table is d, then, the proof states the same event will be observed as running a ^ shape of trip by rest observers on the ground so that there is a relation of (ct')^2=(ct)^2-(vt)^2 and we can derive t'=t/k from it. The problem of this derivation is that when the proof adopted the postulate, it did not adopt both postulates. If we apply the postulate regarding the speed of source, then what will happen is that the ray will not be influenced by the speed of the train, v, and it will go upward relative to the rest frame and when the ray returns to the table it will reach the point behind the emitting point; so that the ^ shape of traveling path is for the moving observer, not for the rest observer; then, based on it, the time equation derived from the postulate is t'=kt, not t'=t/k. The SR derived by the common method is actually inversed SR, not SR.

7.3. The Easiest One

The easiest one is based on hypothesis, assume that it is true then we try to verify it by experiments. However, since SR conflicts with SSIV, if we like to keep SSIV then we have to give up SR.

8. Distance Transformation (DT)

In the setting of GT, DT claims t'=t-((d-d')/c'), x'=x-vt', y'=y and z'=z; d is the distance between the observer in S and the event point. Because d' is very sensitive so that we should handle it very carefully. I will try my best to define d', it is the distance between the event and the observer in S' when the observer records the visual event time (VET). We already know that c' is the speed of light in that environment.

8.1. The inverse DT

The inverse DT claims t=t'-(d'-d)/c'), x=x'+vt, y=y' and z=z'.

9. Conclusion

If photons are solid particles, then, heat is transported by collisions. If we don't care about photons being solid particles or energy packs and focus on the miracle character of photons, Same Speed In Vacuum (SSIV), then we find out both of SR and GR are conflict to SSIV. That is just one way to say SR and GR are wrong. If we look into LT and focus on the variables domain we will find out LT is correct only when v=0. Since SR is born within LT, SR is good only when v=0, at its best. We all know that GR is started from SR, so that GR is questionable too. I provided Distance Transformation (DT) to replace GT and LT. I also provided Distance Relativity (DR) to replace SR & GR. Now I have finished this paper, hope you enjoy it. Thanks for your time.

References

LT, SR & GR on websites.