

**Discovery of**  
**ECT**  
**the Energy Circulation Theory**

**Dream born by Junshin and**  
**Miracle after 50 years**

What is the mathematics

The converse is not necessarily true

Energy Circulation



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# Discovery of the Energy Circulation Theory

Dream born by Junshin and Miracle after 50 years

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## 1. What is the mathematics?

“What is the mathematics?“, this is the phrase that my teacher said in my first math class when I entered Junshin junior high school. There was no room to imagine that this phrase would become so important for me in the future.

In 1966, I entered the Junshin Gakuin, a combined junior and senior high school. It was established by the Belgian catholic organization, Missionnaire de Scheut (Japanese name is Junshin-Kai). There, they removed the range of junior high school at public schools, and provided education in each subject as academics from the first year. It was Hirao-sensei who taught us mathematics with the proposition “what is the mathematics?”. He was a mathematician who was teaching mathematics at a university, and was asked to transfer to Junshin when it was founded. At first, he was asked to become the principle, but he gave the condition to join it as a teacher of mathematics.

In the first class, Hirao-sensei continued with the following after “what is the mathematics?”: “Don’t think you can do math well and aim for mathematics because you have high math scores at high school,” he said. He suggested us to choose each future course after thinking well about what would be the professional mathematics to learn at a university. The mathematics, which he explained and taught by practicing in class, was something I had never imagined and was as follows.

Mathematics firstly assumes some premises as a starting point, which we call as axioms. Axioms are not to be discussed whether correct or wrong, but we logically prove what can be said if we assume them. This proof is the essence of the mathematics. The students of Junshin at that time naturally realized the nature of mathematics of “proof from premises” thanks to the math class of Hirao-sensei. However, when I became a member of a university or a company later, I got to know that few people

realized this nature of mathematics while they knew the proofs in math. Starting from axioms, once something is proved, it can be used as a theorem for further development. Once a theorem is proved, the proof from the axioms can be omitted when we use it for next arguments. Proving another from one theorem and from them to further new ones, a series of logical systems is formed. This is an individual math. To apply the math formed here, the subject must satisfy the axioms originally assumed. For example, in algebra for usual numbers, even if we change the order of multiplication, the product is the same as  $a \times b = b \times a$ . However, if  $a, b$  are matrices or vectors, such a commutative law of products does not hold. Different sets of axioms lead to completely different maths. According to Hirao-sensei, there were about 80 maths at the time, and one mathematician can investigate, such as proof of theorems, in only three maths or so. A new math will be born from a new system of axioms.

Hirao-sensei talked about himself as follows. He misunderstood that he could do mathematics because of good math scores in high school, then he majored in mathematics at a university. However, the mathematics is a complete logic science, and no matter how good the algebra in high school was, it was just one math and was good at the calculation method. He chose mathematics as his major and really struggled. He would have chosen another path, had he known earlier what the mathematics was. Despite struggling, he continued his life as a researcher, achieved some results, and finally got an academic position as a professor at a university. At such a timing, he received an offer to cooperate for the establishment of Junshin-Gakuin. He declined it several times, but finally chose the path to teach mathematics at Junshin.

Hirao-sensei taught us the geometry at the first grade and the algebra at the second grade. This order is his greatness. The geometry should have been the best for us to realize that the mathematics is logic. He

prefaced “what we are going to do is the Euclidean geometry, which is only one of many maths”, and gave lectures for one year. Starting from the axioms, we proved theorems one by one. The mathematical phrase “that’s all, the end of proof” echoed comfortably. For instance, the axiom that there is only one line that passes through a specific point and is parallel to a given straight line is valid in the Euclidean geometry, which has rectangular Cartesian coordinates. However, it does not hold in non-Euclidean geometries such as on a spherical surface. In the second grade, we learned from him the algebra, which is generally called as math1 including simultaneous linear equations and quadratic equations. Again, he led us to be conscious of mathematics as logic. He did not give us an explanation starting from a formula, such as to solve this question using this formula. A formula is a theorem, and we were thoroughly encouraged to prove it before using it. He preached us students, “just prove it once, and use the formula after you are convinced”.

## **2. The converse is not necessarily true**

As a well-known mathematical matter and regarded as a common sense, there is the following fact: Even if A is B, B is not necessarily A. For example, even if “I am a human being” is true, “human being is me” is not necessarily true. It holds true for the individual me, but there are many people who are not me. If we call a set, in which event A holds, as set A, “if A holds, B holds” means that “set A is included in set B”. If A then B and B then A are both true, sets A and B are equal, and said to be equivalent or congruent.

You would think that everybody knows this law as a common sense. However, the existing quantum mechanics surprisingly ignores this common sense to develop its claims. They argued that “This is the quantum mechanics and difficult to be understood by common senses. To accept what quantum mechanics proposes, as it is, is the way to understand quantum mechanics “. This argument is completely unreasonable, but has

been accepted by physicists. As I will explain later, this is indeed a logical bankrupt and ignores the essence of mathematics.

### **3. Physics and chemistry**

Sakata-sensei gave us the physics class in the first grade. He taught us Newtonian mechanics and electromagnetism in a way easy to understand. His major was chemistry, and we learned chemistry from him in the second grade. Sakata-sensei paid a big attention whether all the students understood. If there was a doubt about our understanding, he explained repeatedly, saying, "All right, I see. Let me explain in a more understandable way." An impressive example was the following explanation on inorganic salts: "Taro and Hanako are close and always stick together. When they take a bath, they are apart, but they stick together again when get out of the bath. However, if another couple take a bath with them, all of them fall apart in the bath, and depending on the situation, Hanako ends up with Jiro, who is stronger than Taro, when getting out of the bath." This is a phrase metaphorized in learning the ionic bond, water solubility, and the difference in ionization tendency. We students listened with laughing, but I think we could understand the underlying substance more intensely.

We learned chemistry from Sakata-sensei also in middle and senior grades. When we completed the class of inorganic and organic chemistry of the high school level in the 5<sup>th</sup> grade, he made an important remark, which would affect my life: "The chemistry you have learned so far is not chemistry. The inorganic chemistry is just solving simultaneous linear equations of mathematics. The organic chemistry is nothing more than adding water to decompose or taking off water to condense. Real chemistry comes from knowing the essence of why chemical reactions occur. I want you to study real chemistry at a university." By the time he made this statement, we had been taught that elements in the first period of the periodic table get stable with two electrons, those of the second period get

stable with eight outer shell electrons, and a covalent bond shares two or eight outer shell electrons. However, we did not know why it was so, and only remembered the results. We did not know why an ester is hydrolyzed to a fatty acid and an alcohol, and also swallowed the reverse esterification reaction without questioning.

In the 6<sup>th</sup> grade, Sakata-sensei gave us a lesson on advanced chemistry, which was outside of the guideline for high schools, such as on atomic orbitals, molecular orbitals, and polarities within molecules. Mentioned also on hybrid orbitals, he taught us a qualitative part of so called the organic electron theory. Underlying why these are so is the quantum chemistry, which we need to understand for true comprehension. After mentioned that he also was studying because did not know enough, he explained the following: "Atomic orbitals are quantized and only limited ones are allowed. An elementary particle like electron has the property of spin, which is quantized to be the right-handed or the left-handed. A right-handed rotation becomes left-handed when viewed upside down. There seems to be an infinite number of directions of rotation. Therefore, it is hard for us to understand the quantization of spin. However, only two spin states are allowed, being quantized. I want you to take a challenge to real chemistry at a university."

#### **4. Birth of a lifetime dream**

Around in the 5<sup>th</sup> grade, Sakata-sensei told us the "magic number 3". The number 3 has something special. Three points form one plane. The space is 3-dimensional. In the 6 and 12 base systems, 3 works as an important prime number.

This statement got me think about dimensions. The dimension indicates the number of mutually orthogonal indices required to describe the object. In the case of the space, by how many orthogonal coordinates it can be described. The space we usually feel is 3-dimensional. After

hearing the magic number 3, I realized that any existence in the universe is made up of three dimensions. The three are energy, space, and time. They correspond to elements of the dimensional analysis in physics, where mass is usually used instead of energy. However, I felt energy is more essential than mass, including light and electric energy. I felt with convinced that “an existence (event) is how the spatial distribution of energy changes with a time fluctuation”. What, a dimension is described by a concrete measurement, is a unit. 3-dimensional representations of space, energy, and time are typically expressed in the MKS unit system of meter M, kilogram K, and second S.

I ran into a big problem here. I felt that what is related to electromagnetism can also be treated as energy, but it cannot be expressed in the MKS system and an additional dimension is required. The standard one is MKSA, where the unit A for the electric current is added. A unit other than the current can be used, but a fourth dimension is required in addition to MKS anyway. The mechanical energy can be displayed in MKS. The electric energy uses the same unit (joule) as that for the mechanical energy, but is given by such as the electric charge and current. If the two energies are the same, what is an electric charge? We unconditionally accept the positive and negative electric charges, but their expression requires four dimensions.

Is the dimension to show anything in the universe 4-dimensional? Or, does the basic dimension remain 3-dimensional and is the space, which is an element of it, 4-dimensional? Or can the time be divided to plural dimensions? I could easily guess that not only I did not understand this question, but it was unknown to the world. I recognized it was a tremendously challenging question that could not be solved in my lifetime. At this time, however, a dream was born that “I want to solve this mystery of the fourth dimension for electromagnetic phenomena someday, even if it



would take my whole life". It is clear that without Junshin Gakuin, I could not have been able to have such a dream. Once again, I would like to extend my special thanks to Hirao-sensei, Sakata-sensei, and other teachers at Junshin.

## **5. My course for life**

At that time, the high school curriculum ended in the 5<sup>th</sup> grade at Junshin Gakuin, and the curriculum in the 6<sup>th</sup> grade emphasized each individual autonomy. From the outside, it was seen as a school focusing on entrance exams, but it was full of individuality and a free atmosphere. Among my classmates, some liked canzone and were studying Italian, some were studying French, some were solving math problems of a university level, some were enjoying Haikai (seventeen-syllable verse) and Renga (linked verse) with friends, and some were enjoying jazz at jazz cafes; the students were really unique.

I had doubts on studying for the exam. It was a pleasure to study in order to understand the content, but once I understood the essence, I could not find a value in solving difficult application problems like tricks. I felt that trying to get a high score in an exam was selfish and perverse. Then, should I give up on entrance exams? Acknowledging that I had both idealism and selfishness, I decided to go to a university and told myself that I had to accept studying for entrance exams.

What course should I take? I knew that I liked basic sciences and was not cut out for applied sciences. However, I was not good at mathematics, which is the most basic logic. There were a number of masters of proof around me, who could have come up with such a thing that I could never think of. In so called the math 3, differential equations appeared. Although I understood the cores of the replacement integration method and the partial integration method, I could not easily solve the problems using them. However, there were many classmates, who made me surprised at why

they could notice such a substitution method. It was clear that physics was the object of my greatest interest. Should I aim to enter a department of physics at a faculty of science, and try to elucidate the origins of phenomena that occur in the universe? However, I was well aware of my own laziness and worldliness, I thought it would be impossible for me to pursue research solely focused on academic pursuits. Such thoughts came to my mind as entering an engineering school related to physics and aiming for a research position at a company, or studying chemistry and moving on from chemistry to quantum chemistry and physics.

I happened to be able to enroll in a pharmaceutical university. In the 4<sup>th</sup> grade and graduate school, I majored in organic chemistry, then joined a research laboratory of organic chemistry at a pharmaceutical company. Later, I moved to the department of in- and out-licensing new drug candidates and technologies, then to the R&D planning department. I also changed jobs and worked for a total of three pharmaceutical companies. Strangely enough, I, who had disliked applied sciences so much, in fact gradually moved to be involved in more applied ones, from chemistry to biological science and to clinical science.

## **6. Adoration for physics**

I have never received a professional education in physics through a student or a member of a society. However, my interest in physics did never wane, and I enjoyed reading magazines and books in it for the general public. There were full of books on such as the origin of the universe and the elementary particles composing matters, which aroused my interest.

When I was doing the organic chemistry, in order to understand its roots, I challenged the quantum chemistry, which theoretically dealt with atomic orbitals and chemical bonds, as well as its basis; the quantum mechanics. I had an understanding to some extent on the basic formula of the Schrödinger equation and the form of its solutions as a wave function.

However, it was not clear enough for me. I keenly felt that I did not understand the real essence of them.

The quantum chemistry targets the orbiting of electrons in an atom, and had made a great contribution in understanding the chemistry. However, I felt that the quantum mechanics for elementary particles themselves, that is, in the particle physics, was in a chaos. No matter how much I searched, I could not find why the currently proposed 17 types of elementary particles including quarks could be assumed to be fundamental entities that could not be divided any further. Strangely, although elementary particles are considered as fundamental ones, the mass (energy) of them cannot be predicted theoretically, but is said to be obtained as a measured value from particle collision experiments. Here is an important note. Even though a certain quark is said to have been observed, the quark was not detected directly but the particle decay reaction, which was predicted by the theory that assumes it, was observed. If it is proved that the observed results are impossible without assuming the quark, then its existence is justified. However, the reality is far from the proof. The elementary particles were assumed as components that somewhat made sense, and there was no rationale for them. As for the structure of each elementary particle, the argument on it is abandoned by assuming it as an elementary one that cannot be divided further.

When I was in a high school, I admired Einstein like many people. However, since I did not understand the theory of relativity then, I vowed to derive the results of the special relativity by myself when I would enter a university. After I read several books and actually derived the results, I got disappointed. There was no theory. There was the "law of constancy of the light speed", which states that the propagation speed of light is constant regardless of the speed of the light source or the observer. This was from the result of the famous Michelson-Morley experiment. The result was

difficult to accept as a property of waves, but the constancy of the light speed became to be regarded as true since it was a measured one. Subject that the light speed was the same in both of two reference systems that were moving at a constant speed to each other, Lorentz proposed the transformation formulas of space and time coordinates between the two references. He reported them firstly in 1900, then the final ones with a correction called as the Lorentz transformation in 1904. The special theory of relativity, which Einstein reported in 1905, was the same as this Lorentz transformation, and there was no novelty. Einstein himself said that he had not known the Lorentz transformation, but why was it admired as his achievement? A difference we may find is that Lorentz predicted that the transformation would apply only to light while Einstein assumed that it would apply to all bodies not just light. Another disappointment of me was that no rationale was mentioned for the Lorentz transformation. Although it is called as the theory of relativity, it is not a theory at all but formulas for coordinate transformation. The constancy of the light speed can be a theory as an experimental rule, but it was found by Michelson and Morley.

Much more than the particle physics, the cosmology, which deals with the evolution of the universe, is full of unknowns. Many physicists have been confronting the fact as it is worthwhile taking a challenge of clarifying these unknowns. There is so-called the standard model, but its ground is weak. It is said that the universe began with a rapid expansion called as the inflation, but there is no idea why it occurred or what caused it. Immediately after, the universe became extremely hot, which is called as the big bang. The universe with a high temperature and a high pressure has been and is changing to that with a lower temperature and a lower density.

The expansion speed of the universe was expected to get slower due to the gravity. In 1997, shocking news spread around the world. It was

the interim report of supernova observations, and argued that the expansion of the universe was accelerating. Their first full paper was published in 1999, from data of 42 supernovae. It has come to be regarded that there is an unknown energy, which accelerates the space expansion and is called as dark energy.

Regarding the structure of the galaxy, it is believed that there must be a massive black hole at the center of a typical galaxy because the gravitational attraction is insufficient to rotate without a black hole. Also, the rotating speed of a disc galaxy is almost constant regardless of the radial distance from the center. It is contrary to the expectation that the larger the radial distance is, the slower the rotating speed should be as the gravity and the centrifugal force are in balance. Then, it came to be regarded that there must be an unknown substance above and under the disc of the galaxy, which exhibits only gravitational interactions, and is called as dark matter.

As mentioned above, there are so many unknowns about the universe and particles, and many physicists are trying to clarify them. I was also interested, but my lack of professional training in mathematics and physics made me feel that there were too many things I did not understand before examining the real unknown. I realized that it was impossible for an amateur like me to take on the challenge on physics, and that it was a world reserved for physics experts who had received sufficient specialized training. It is practically impossible for me to enter and study in a physics department from now. Physicists were people above my world, and I respected and envied them.

## **7. Start of a challenge to physics**

In 2007, a regular trip with my wife was cancelled. I looked for a university summer course instead, but I could not find one interesting to me. At that time, I found out that an international conference on astrophysics would be held in Nara. I applied for participation, thinking that it would be a rare

chance to see the cutting edge of astrophysics. It was the 8<sup>th</sup> Asia-Pacific International Conference on Gravitation and Astrophysics (ICGA8), held at the campus of the Nara Women's University for about 5 days in late August.

Various models of the universe were presented in the conference, many of which were based on the superstring theory. It was different from the standard model and attracted a great deal of attention at the time. An elementary particle is a multidimensional vibration of a string, and the vibration itself does not have a mass (energy). The two ends of the string are attached to the D-brane (membrane), and the boundary conditions at the ends give it a mass. The brane is considered to be the space of universe. It is said that any dimensional brane is possible theoretically, but our universe is a three-dimensional brane. The graviton, which mediates the gravitational force, is a string, whose two ends are connected without binding to the brane, and shows zero in mass. From the point of view of cosmology, branes are regarded more important than strings, and two branes collide and split into two branes again. Collisions and divisions like this are repeated. This kind of cosmology attracted a big attention. However, there were so many things I could not understand: what kind of force works between two branes, what force makes each brane expand and contract, and whether the two forces are same and gravity.

Taking a long lunch at a cafe during the conference, I was thinking of what is a decrease of dimensions. As an example of reduction in dimensions, I wondered what would happen if a slit of the same depth but a very thin width was placed at a part of a dam's weir. The vibration of water in the dam is three-dimensional, but that in the slit should be two-dimensional with increase in the amplitude due to the loss of the dimension for the width. I speculated that the space expansion would have been caused by the breaking down of boundary conditions from steady states and the following expansion in several dimensions. There were not many presentations

impressive to me, and the lunch time was getting longer and longer, for which I was immersed in thinking about the reduction of dimensions and the expansion of the universe. Then I perceived a very important thing. It was what would happen if we moved the slit of the dam above mentioned along the weir. It is possible to record how the vibration of water in the dam changes as the position of the slit alters in the weir direction. It means that the fluctuation in the dam is traced by the weir direction. If this change in the weir direction is made in one direction, it would correspond to the passage of time. I intuited that it is the essence of what the time is. I was trembling with excitement, thinking that I had found a clue to the essence of time and the universe.

## **8. Nature of time and 4D sphere (3D surface) model of universe**

As soon as I returned from Nara, I considered and wrote down a possible spread of energy distribution and what time is, a little by little through trial and error. The first documentation was completed in about two weeks. During this time, I was so excited that I could barely sleep.

As the starting point, I premised that the energy is a vibration in multiple dimensions. I argued that everything that exists in the universe falls into energy, and that the region where energy exists is the space of universe. I thought that the 4-dimensional space was expanded by the big bang, and the energy changed to spread on the 3D surface of a 4D sphere. It was like a soap solution at the tip of a straw (3D), and when air is introduced, its distribution becomes only on a spherical surface (2D). This space evolution model here was conceptual, and the grounds and expressions were unsure. However, the model that the cosmic energy is distributed on the 3D surface of a 4D sphere has survived valid to now.

Any vibration needs a medium, that is, what is vibrating. I assumed that a vibration of an energy would vest an additional energy. If we express an energy, which is a high-dimensional vibration, as a one-dimensional one, we can take that the energy due to the vibration in the remaining dimensions is fluctuating in this dimension. A one-dimensional vibration can be expressed as a circulation in two dimensions. In this way, an energy can be expressed in many ways as what an energy is how moving, depending on a target direction. We can take the universe as that the energy, which exists in the entire space as a medium, is vibrating. I proposed that a vibration of the space energy, which is the medium, is our observable energy as a particle or light.

To express a vibration, we need a change in time. It is necessary to clarify what time is and its essential properties. I thought that an absolute time does not exist, and only relative values in individual dimensions of an energy vibration are given. For instance, we can express how the positions in other dimensions change at each point of the circulation of the largest period. I named such a motion serving as a reference as "to trace" and its dimension as the "tracing dimension". This is exactly the essence of time. Tracing by a certain dimension is equal to treating the dimension as time.

A time dimension is the same as a space dimension as a place where energy exists. The value of the time dimension is just one of positions in individual dimensions of energy. The time dimension intersects with the space dimensions and shows the same energy. This is a direct tracing. For a different energy at a different place, there is a different tracing dimension. However, if there is a common variation in multiple energies, it can work as a common tracing dimension. Furthermore, if there is a motion that exhibits a common relative change when traced by the common tracing dimension, it can indirectly trace multiple energies at different locations. This is the clock. If we use the radius of the 4D sphere of the universe as a common



tracing dimension, we can express the cosmic evolution very simply. I named it as the “Observed Time”.

Later at a Junshin class meeting, a friend told me that the following is the mainstream way of understanding time perception in philosophy: “Time exists only at the present. The past is the present record of what happened in the past, and the future is the present prediction of what will happen in the future.” This exactly accords with what I thought about the nature of time. It is said that we are looking at the past when see very distant stars, but we must be careful. We are looking at not the past but the light that was emitted in the past and has just arrived at the earth now. The light itself has changed in all of the wavelength, frequency, and amplitude from those when it was emitted. We are seeing exactly the current light.

## **9. First paper in physics**

In 2008, I presented the nature of time and the universe at the poster session of an international workshop called as DICE2008. It was held every two years in a small town near Pisa in Italy. I firstly sent an outline of my presentation and applied to participate, then a professor of the University of Pisa; an organizer of it, inquired me, “Your claims regarding time are very interesting. However, even if I searched about you, I could not find anything. What is your affiliation?” When I informed him that I was not a physicist but worked for a pharmaceutical company, he replied that it was unsure whether my work would be able to be published as a paper in the proceedings, but they allowed me to attend the workshop. My first paper in physics was published in 2009 as proceedings in the Journal of Physics; Conference Series. The title was “Nature of tracing dimension, imaginary order of freedom and our observed time passing at constant speed”. After that, I participated the workshop every time until DICE2016, and reported on the speed of light, the space expansion, the Hubble diagram, and so on. During this time, I submitted my works to many scientific journals in physics,

but all of them were rejected, and were published at last as proceedings of DICE in the above journal.

## **10. Speed of light and Hubble diagram**

If the light is a vibration of the space energy, its propagation speed decreases as the space expands. As a general property of waves, it is well known the empiric rule that the propagation speed of waves is proportional to the square root of the density of the medium. I presented the mathematic formula that shows the change of the light speed as the space expands. It claims that the light speed has been slowing down over time. It negates the law of constancy of the light speed, which is believed in the standard physics and presumes that the light speed remains constant from the past to the future.

As stated on the pages 10 and 11 of this book, the law of light speed invariance was based on the Michelson-Morley experiment. The propagation speed of a wave in the medium is constant regardless the speed of the emitter to the medium. However, if the observer is moving to the medium, the propagation speed varies by its speed. If the earth is moving to the medium, the light speed should change depending on a direction of observation. It is called as the anisotropy of the light speed. Michelson and Morley expected that the anisotropy should be able to detect by rotating the whole apparatus. This apparatus uses a half mirror to split the beam from an emitter into a straight beam and a reflected vertical beam. Both beams are reflected at the ends of the arms of the same distance, return to the half mirror, and are combined and sent to the detection device. In the detector, the beam passes through two slits slightly apart, and interference fringes are projected on the rear screen. They projected that the interval of the fringes would change with the rotation of the apparatus. But they did not measure a notable change in the interval or the position of the fringes. There are very important notes here. The combined beam of the

former two beams passes through the both slits. It is not the case that one beam passed through one slit and the other beam passed through the other slit. The other important point is that even if the directions of the horizontal beam and the vertical beam to the medium in the two arms are different, both beams are guided to the same direction to interfere in the detection device. Therefore, the light speed gets common for the two beams there. After all, in this experiment, it is not possible to directly observe the difference in the light speed, and the light speed difference at the light path on the way appears as the difference in the phase at the detector between the two beams. I presented the formula for the interference wave to the change in the difference of the light speed between the two beams. The phase difference due to the light speed difference in the intermediate path between the two beams appears as a difference in the amplitude and the phase of the combined wave. That is, the difference in the brightness of the interference wave will be observed. The difference in frequency and wavelength between the two components in the combined wave remains zero and does not change, and the width of interference fringes does not change.

This kind of an apparatus is called as a Michelson interferometer, by which many people carried out experiments but could not detect a difference in the width of interference fringes. Physicists then concluded that the light speed had no anisotropy and that the light had no medium. Later physicists have also perceived that the law of constancy of the light speed has been proved by experiments over 100 years and is an absolute truth. However, they did not check the measurement principle of the experiment at all. None of the physicists whom I asked could explain the principle, but they just accepted the conclusion as proven. In recent years, experiments by modern devices using crossed resonators instead of two long arms were carried out, but they combined the two beams and detected the difference in the

frequency as a difference frequency (beat). They also misunderstood that there would be a difference in the frequency of the combined wave.

Michelson interferometers are in operation for observing the gravitational waves. If we change their setting, we should be able to easily detect a circadian variation in the brightness of the interfered wave caused by the rotation of the earth. In the Michelson-Morley experiment, the interference waves were unstable and often disappeared, and they revived the image by fine-tuning the position of the mirrors. Although they said that it was due to noise, it seems more likely that it was a variation in brightness due to the anisotropy of the light speed. There have been seen some other examples that seem to suggest the anisotropy of the light speed. In the world of physics, it is said that if one disagrees with the constancy of the light speed, he or she will be excluded from the academic society, meaning that he or she will lose its job and its paper will be rejected. However, I wish any physicists would take on the challenge with courage to carry out an experiment with a Michelson interferometer on the light speed.

The brightness of distant stars decreases in reverse proportional to the square of the distance. In addition, until the light reaches the earth, the space has expanded and the wavelength has been stretched, which is called as the redshift. It is called as the Hubble diagram where data for many stars on the brightness on the vertical and the redshift on the horizontal axes are plotted. The brightness provides the information on distance if the luminosity when it was emitted is known. Type Ia supernovae show the nearly same maximum luminosity, and their brightness gives distance information. For distant supernovae, the observed redshift was smaller than what was expected from the distance (brightness). Provided that the light speed has been unchanged from the emission to the present, they treated that the distance divided by the constant light speed was the time that it took to arrive. Then they concluded that the expansion speed of the

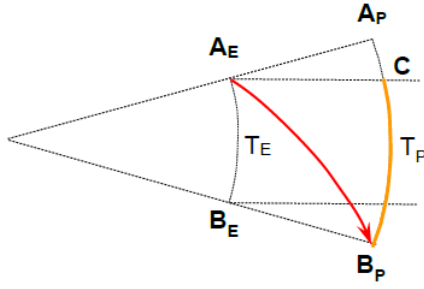
universe was slower in the past, that is, the space expansion is accelerating over time. This was the announcement of the Supernova Cosmology Project (SCP) by Perlmutter, et al. Almost all physicists accepted this conclusion, and many are trying to find dark energy that is said to cause the acceleration of the space expansion.

Based on my formerly reported formula for the light speed by the cosmic radius, I published in 2017 a paper on details of the Hubble diagram as proceedings of DICE2016. This was done by carefully examining the papers by the SCP and performing the same data processing as they did. As a result, it was found that the prediction curve when the current radius of the universe is about 0.7 times the maximum one is in an extremely good fit to the observed data of supernovae. This strongly supports that the light speed is slowing down and the space expansion is not accelerating, so there is no dark energy to cause the acceleration. The supernova data are an observational evidence showing that the light speed has been slowing down, but not that the space expansion is accelerating.

## **11. Predicted graphs and observed values in Hubble diagram**

Let me explain a little more using graphs about the results of the Hubble diagram that I mentioned above. If you feel difficult to read, please skip the explanation here and move to the next section, since is sufficient the conclusion that the standard physics incorrectly interprets the space expansion as accelerating due to the misunderstanding that the light speed has been constant.

There are several types of star distances; the distance when the light was emitted at the star, the current distance when the light reached us now, and the distance for which the light has actually traveled from the star to us.



**Figure 1.** Light propagation and space expansion

Let us consider the case of Fig. 1. The radius indicates the spherical radius in the 4D space, and the arc shows the distance in the 3D space. The cosmic radius can be treated as time, and is called as time here, but if you feel uncomfortable, please read it as the cosmic radius. Consider the case that light is emitted at the location A at time  $T_E$ , and arrives at the location B (Earth) at time  $T_P$  (current). The distance at the emission is  $A_E-B_E$ , let  $D_0$  be for which. The light propagates from  $A_E$  to  $B_P$ , but the propagation distance in the 3D space is  $C-B_P$ . We call it as the “light propagated distance” and let  $LD$  be for it. The current distance when we observe the light is  $A_P-B_P$ , called as the “present distance”, let  $PD$  be for it. If the space expands  $n$  times,  $PD$  will be  $n$  times  $D_0$ , and  $LD$  will be  $(n + 1)/2$  times  $D_0$  as shown by the following equation.

$$PD = nD_0, \quad LD = D_0 + \frac{PD - D_0}{2} = \frac{n + 1}{2} D_0$$

The light propagated distance  $LD$  is determined from the observed brightness, and the present distance  $PD$  is obtained from the following relation.

$$PD = \frac{2n}{n + 1} LD \tag{1}$$

On the other hand, the wavelength also increases by  $n$  times during this period, and the redshift  $z$  is defined by the following formula.

$$\frac{\lambda_P}{\lambda_E} = n, \quad z = n - 1$$

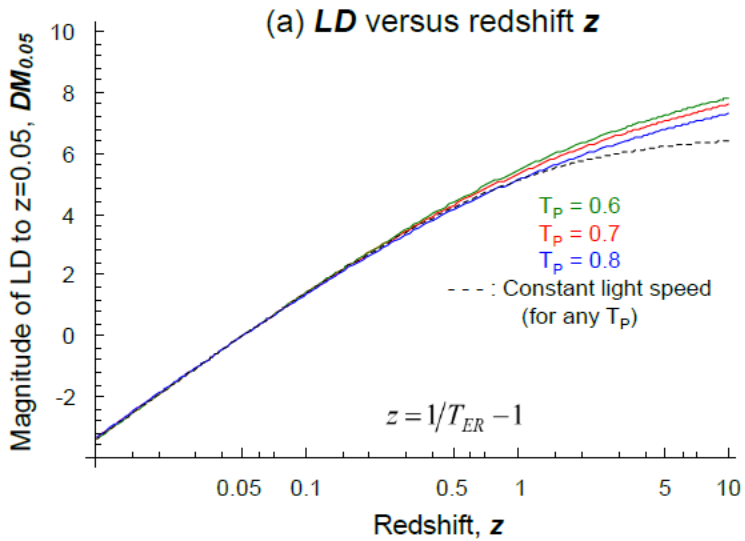
The Hubble diagram is a plot of the present distance  $PD$  on the vertical axis and the redshift  $z$  on the horizontal axis.

The light propagated distance  $LD$  is obtained by integrating the light speed over the time from the emission to the present. Here, we obtain  $LD$  by integrating the light speed formula, in which the cosmic radius is used as time, that is, variation in the light location per variation in the radius, over the change in the radius. (Light speed formulas will be explained later in Section 13.) We take the distance showing the redshift  $z = 0.05$  as the reference. We use the multiplication of a distance from the reference as a distance modulus (DM), which is expressed on a logarithmic scale. For instance,  $DM_{0.05} = 3$  indicates the  $10^3$  times the reference distance showing  $z = 0.05$ .

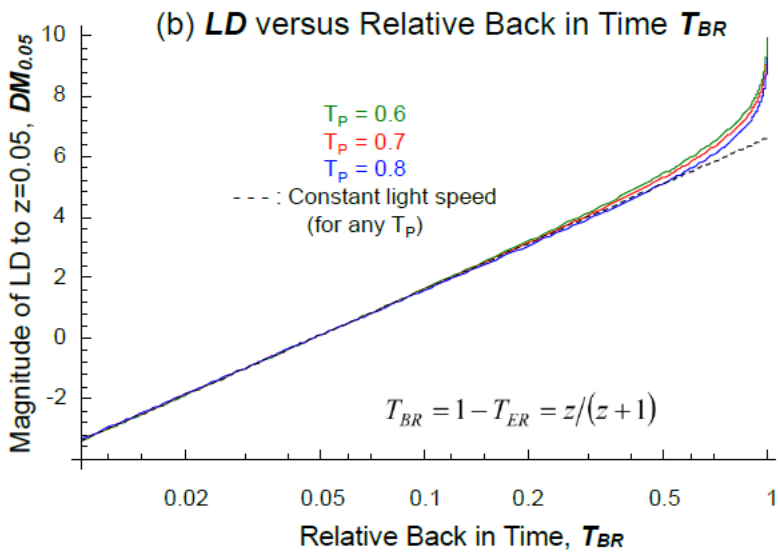
Fig. 2 below shows a graph, in which  $LD$  is expressed as a distance modulus on a logarithmic scale and redshift  $z$  is also on a logarithmic scale (double-logarithmic graph). The dotted line is for the virtual case that the light speed is constant without change, and the solid lines are actual graphs where the light speed changes as the space expands. The blue line is for the case that the current cosmic radius is 0.8 times the maximum ( $T_p = 0.8$ ), the red one is for 0.7 times, and the green one is for 0.6 times.

In Fig.3, the horizontal axis is the time from the emission to the present instead of the redshift, the unit of which is the ratio to the present time  $T_p$ . The dotted line for the invariant light speed becomes a straight line, but in reality, due to the decrease in the light speed by the space expansion, distant stars show greater distances than a straight line. The Hubble's law states that the speed, with which a star moves away from us, is proportional to its distance, but this speed is not proportional to its redshift. The redshift should not be plotted on the horizontal axis to represent the

Hubble's law, however, the most of reports have used the redshift in the Hubble diagram.



**Figure 2.** Light propagated distance *LD* and Redshift  $z$



**Figure 3.** Light propagated distance *LD* and the time period from emission to present

In the current astronomy, the brightness is converted to the present distance *PD* as a distance index, and shown in the Hubble diagram. The



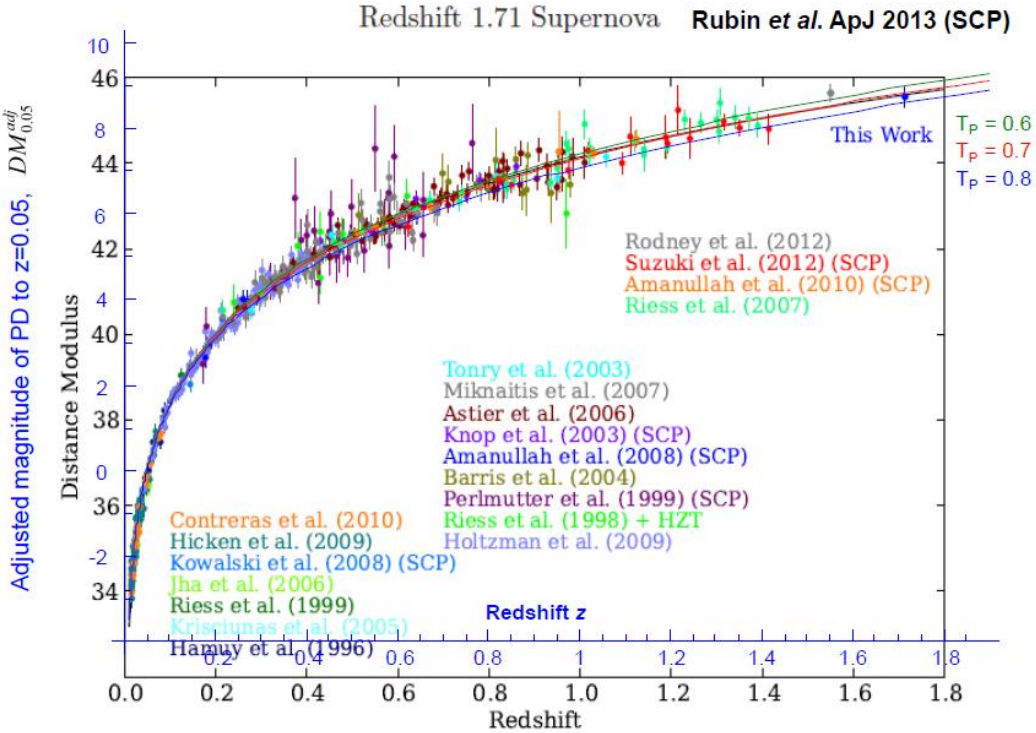
SCP (Supernova Cosmology Project) uses the following standard data processing, and obtains the values of  $PD$  as a distance index. The present distance is obtained by multiplying the distance  $LD$ , which is calculated from the brightness of a supernova, by the space expansion ratio  $n = z + 1$ . ( $LD$  is called as the luminosity distance, but synonymous with the light propagated distance.) This conversion is called as the time dilation, but is actually incorrect. The measured distance is not the distance at the emission  $D_0$ , but is the light propagated distance  $LD$ . Therefore, it is necessary to use the conversion formula of Eq. (1) shown before.

The time dilation has another aspect. The horizontal axis in Fig. 3 is the value from the Time of emission  $T_E$  to the present Time  $T_P$  (cosmic radius as Time) relative to  $T_P$ , shown by  $z/(z + 1)$ . If we multiply both the vertical and horizontal axes by  $(z + 1)$ , the linearity of the line for the case of constant light speed is preserved. In this case, the horizontal axis becomes the redshift  $z$ . If we want to see the linearity with the redshift, we should perform only the time dilation multiplying  $LD$  by  $(z + 1)$ .

Actually, in addition to the time dilation, a process called the K correction is performed. This converts a measurement at a redshift  $z$  to a measurement in the rest frame ( $z = 0$ ). It includes the cross-filter adjustment of the absolute magnitude depending on the wavelength used and the adjustment of the difference in the distance index among the two frames. The adjustment of the absolute magnitude is marginal, and the frame transformation of distance occupies most of the correction. I demonstrated that the frame transformation part of this K correction completely matches Eq. (1). In other words, the essence of the K correction is the conversion from  $LD$  to  $PD$ .

In general data processing in astronomical observations, in addition to the K correction, the time dilation to multiply the distance by  $n = z + 1$  is performed. If we use the present distance  $PD$  in the Hubble diagram, it is

sufficient to convert  $LD$  to  $PD$  (K correction) and the time dilation is not necessary. But in order to compare with the Hubble diagram reported by the SCP, we use the product of  $PD$  by  $n = z + 1$  on the vertical axis. As in the case of  $LD$ , the ratio to the distance corresponding to  $z = 0.05$  is shown on a logarithmic scale. We take the redshift on the horizontal axis, but on a normal scale instead of a logarithmic scale (semi-logarithmic graph). Fig. 4 below is an overlay of the predicted graphs obtained in this way and the reported results from the SCP in 2013.



**Figure 4.** Overlay of theoretical values and observed values

The scale of the vertical axis is different among the two graphs because the reference distance is different. In actual measurements, the distance values at the same redshift vary. This is due to the Doppler effect based on the movement of individual stars. Stars are rotating within a galaxy, galaxies are rotating within a galaxy cluster, and galaxy clusters are rotating within a supercluster. In recent years, very large-scale motions in the

universe have been reported one after another, but they cannot be explained by the standard cosmology and remain as an unsolved problem. The Doppler effect is that the wavelength becomes shorter when a light source approaches, and gets longer when it moves away. The wavelength of each star is the addition of the Doppler effect to the redshift due to the space expansion. However, when the values of many stars are averaged, the Doppler effects are cancelled out and can be ignored. Although it is not shown in Fig. 4 above, the graph for the virtual case that the light speed has been constant is below the curve for the present time (radius) is  $T_p = 0.8$ . As we can see from the superimposition with the actual measured values,  $T_p = 0.7$  showed an extremely good agreement.

In this way, based on the light speed formula that it slows down as the space expands, the theoretical values agree with the observed data. This fact indicates that the space expansion is not accelerating and there is no need to introduce dark energy. The space expansion is slowing down by the normal time (original time), and is constant if we take the cosmic radius as time (Observed Time).

## **12. A miracle after 50 years, making the dream come true**

Regarding the beginning of the universe, I thought that the balance of the attractive and centrifugal forces in the cosmic energy circulation broke by some reason, and that the circulating speed changed to the initial speed in the radial direction, and it started to expand. At the time, I thought that the attractive force was the gravity. A rough projection of the radius where the gravitational and centrifugal forces were balanced, however, resulted in an extremely large value. If it would be the case, the gravitational force should have been too weak to give a circulation before and just after the expansion.

Promoting the idea that a movement of an energy vests an additional energy, I got to think that in an energy, its source energy should be

circulating. The so-called elementary particle would be also a circulation of energy. However, what kind of a force controls the circulation? The electromagnetic force was one candidate, but it does not be applied to non-charged particles. I proposed that the space energy exists in the entire vacuum space. I considered some scenarios such as, that the space energy, where very small polarized units of positive and negative charges are lined up, vibrates and shows a tension by electric force. However, it was insufficient in evidence and I could not mathematically formulate it.

I thought that if this mystery of the force, which is generated by vibrations of the medium, would be solved, the structures and properties of known particles should be elucidated. However, no matter how much I thought about it, I could not find anything that made sense. It repeated for many days that I thought about a possible candidate in bed, tested it, and found it wrong at the end. On the other hand, the existing theory of particles was bankrupt and a fundamental reconsideration on it was needed. I continued to examine, believing that this approach should have a potential to lead to some kind of breakthrough. However, no breakthrough was found, and I became no longer able to think of any idea for a candidate. I gave up on thinking about it all the day, and shelved the issue. When I remembered the problem, I was tracing previous attempts that had failed.

I started to write a new article in order to logically develop the idea that a movement of an energy vests an additional energy. I was near to be able to logically develop what the mass is. However, it was still necessary to elucidate the force that controls the energy vibration. I was proceeding with other considerations, while postponed the issue as "some kind of force, which is unknown, acts on the vibration of the space energy, and gives a tension to the medium". At that time, it suddenly occurred to me, "maybe there is a force that acts on the movement of energy". After a while, I became convinced that it was an incredible breakthrough that would solve

everything. Between two energies, there acts a force that works based on the movement of energy, that is, the momentum, while the gravitational force works based on the magnitude of energy (mass). This force should be the real features of the electric and magnetic forces, and the strong and weak nuclear forces in the standard physics. This idea was to become a breakthrough to fulfill my dream that was born at Junshin Gakuin 50 years ago. All I can say is that it was really a miracle.

### 13. Energy circulation theory

I decided to develop a logic from scratch regarding the nature of the universe. We define the “energy” as what exists in the universe. Other physical properties are defined secondarily from energy distribution, motion, and interactions. As a starting point, I set the following premises.

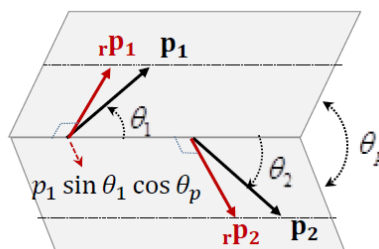
- (1) An energy can be expressed by an intrinsic energy and its velocity, as shown by the following formula.

$$E = M_1 V_1^2 = M_2 V_2^2 = mc^2 \tag{2}$$

- (2) Between two energies, a force works based on the momentum as shown by the following formula.

$$F = K_f \frac{\mathbf{rP}_1 \cdot \mathbf{rP}_2}{d^2} = K_f \frac{p_1 p_2}{d^2} \cos \theta_p \sin \theta_1 \sin \theta_2 \tag{3}$$

$K_f$  : Fundamental force constant



**Figure 5.** Momentum components vs the distance direction

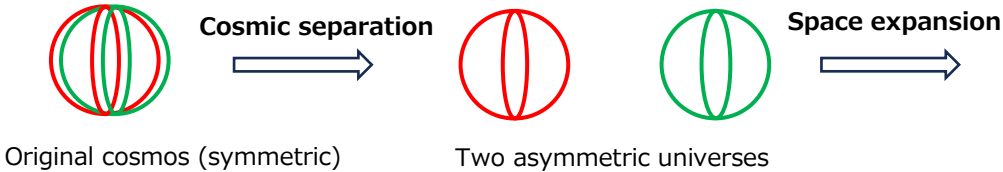
(Separately, the gravitational force acts based on the amount of energy.)

These two premises are assumptions and correspond to axioms in mathematics. There are many ways to take the intrinsic energy in (1) depending on the direction of target, but any combination gives the same energy by the product of the magnitude of the intrinsic energy and the square of its velocity. The intrinsic energies have the property of mass, but we define those intrinsic energies that move at the light speed as the “mass” in the narrow sense. I named the force in (2) as the “fundamental force”. The charge that exerts this force is a vector, and the formula includes three angular factors in addition to the distance. A plus force is repulsive, and a minus force is attractive. Antiparallel energies get to circulate due to the attraction by the fundamental force, giving an energy circulation. The momentum changes depending on how the intrinsic energy is taken, and the fundamental force constant  $K_f$  also changes. However, if we choose such intrinsic energies that move at a common velocity, the fundamental force constant gets unchanged. Unless otherwise mentioned,  $K_f$  shall be the fundamental force constant for intrinsic energies (masses) that move at the light speed  $c$ . I named the development from these two premises as the “energy circulation theory (ECT)”.

It should be hard to believe, but the energy circulation theory (ECT) has miraculously solved unsolved problems in the existing physics one after another. Let me introduce some of the aspects of the universe and particle physics derived from the ECT.

The original cosmos was multi(M)-dimensional vibrations, which can be expressed as a collection of  $M/2$  pairs of 2-dimensional circulations. Each of the pairs consisted of coupled two conjugate circulations ( $\pm\omega$  of frequency). When the distance of the energy distribution becomes larger than a threshold in a certain direction (1D), the original amplitude cannot

be maintained and it starts to expand. The coupled pair including this direction separates in the flat manner to two isolated circulations. Along with this, another coupled pair of conjugate circulations separates in the orthogonal direction. Like this, the original cosmos divides to two universes, which we call as the “cosmic separation”. The below Fig. 6 is an image in 3D, but in fact the circulations are in the planes  $X_1$ - $X_2$  and  $X_3$ - $X_4$  in 4D in total.



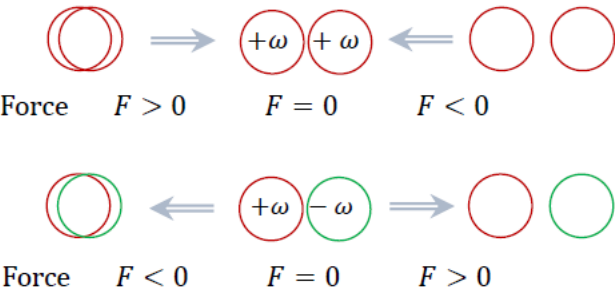
**Figure 6.** 3D image of the cosmic separation in 4D space

In each universe, the balance of the fundamental force and the centrifugal force is broken due to the pair separation, and the space expansion occurs in the four dimensions, which include the two circulations. We call it as the “space expansion”. A pair of circulations in the other dimensions (“rest dimensions”) also divides into two universes, but each of separated one keeps as a pair of coupled conjugate circulations. Even if the space expands, the radius remains unchanged, and the total momentum is cancelled out to zero. A circulating energy in the rest dimensions acts as an intrinsic energy in the 4D space.

The cosmic energy derived from the two energy circulations, which are expanded in 4D, is distributed in a 3D surface of a 4D sphere. (Here we use the term “4D sphere” as a sphere in the 4D space, while it is generally called as “3D sphere” showing the surface.). We call the 3D surface as the “space dimensions”, and the radius of the 4D sphere as the “hidden dimension”. The width of energy distribution in the hidden dimension H is very thin and unchanged by the space expansion. We let  $2\mu_0$  be the width, and treat the 4D sphere of the radius  $\mu_0$  as the smallest unit of the space.

The cosmic energy in total is circulating and asymmetric, but we can divide it into the symmetric part, which we call as the “space energy”, and the asymmetric part, which we call as the “apparent energy”. The space energy is distributed even in the entire space of universe, and consists of pairs of coupled conjugate circulations. Each pair shows zero momentum and no fundamental force with others. We named the space energy in the unit space of the radius  $\mu_0$  as the “spacia”. An apparent energy is given as an additional circulation to a constituent circulation of the conjugate circulation pair of a spacia. An apparent energy can be also expressed as a vibration of the space energy as the medium.

A circulation of an apparent energy shows the properties of the particle. It can be static to the space energy, keeps a constant radius by the intra-circulation interaction by the fundamental force, and interacts with other circulations to show an attractive or repulsive force. We can define the “particle” as an energy circulation. In the energy circulation here defined, the intrinsic energy is distributed continuous and even on the circumference, and its value is the sum of local ones over the entire circumference. Among the interactions between energy circulations (particles), the image of the flat interactions within one plane is shown in Fig. 7 below.



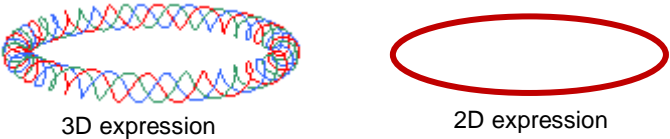
**Figure 7.** Flat interactions of energy circulations

Between two circulations with the same direction  $+\omega$ , the force is repulsive when they are overlapped (left), and is attractive when they are separated without an overlap (right). In the state shown in the center, where they



are attached, the force is zero, and this is the most stable. In the case of opposite directions as  $+\omega$  and  $-\omega$ , an attractive force acts at locations from the overlapped state (left) to the adjacent state (center), and the two try to return to the conjugate double circulation (left). However, once they separate more than the adjacent state, a repulsive force acts, and they recede. The state, where two circulations of the same direction are overlapping, occurs immediately after one energy circulation divides into two. In addition to the flat separation above mentioned, the two also cause the orthogonal separation, in which they recede in the vertical direction.

The apparent energy just after the cosmic expansion becomes unable to be maintained as a circulation as the space expands, and the energy on the whole circumference decomposes at once to numerous local circulations, which are orthogonal to the parent one. We call it as the “cyclic decomposition”. We call that in the orthogonal direction into two ones as the “orthogonal separation”. As the space expands, the universe repeats a lot the cyclic decomposition and the orthogonal separation, giving daughter circulations of smaller energies. We call those circulations, in which a cyclic decomposition is no longer possible, as the “galactic seed”. A galactic seed is a space-space dimensional circulation, the intrinsic energy of which shows a helical motion by the 3D expression (Fig. 8). The selected intrinsic energy differs between the 3D and 2D expressions.



**Figure 8.** 3D or 2D expression of a space-space circulation

Along with a further space expansion, a galactic seed divides to two ones by an orthogonal or flat separation. A galactic seed releases the stellar seeds. A stellar seed further releases daughter circulations, and finally shows a cyclic decomposition to form a star then. Released circulations

from a stellar seed further decompose or separate to smaller ones. The smallest energy circulations, which are released in this way, are the elementary single circulations, which have the same radius  $\mu_0$  as that of the spacia. We express that in hidden-space dimensions as  $iS$  and that in space-space dimensions as  $S$ . We call their coupled conjugate circulations as a double circulation  $iD$  or  $D$ . We defined what is quantized in one spacia as the "quantum particle". A quantum particle has the radius  $\mu_0$ , and is a composition of single or double circulations, or their excited forms.

The elementary single circulation has the same radius  $\mu_0$  and frequency  $\omega_0$  as those of the spacia, and its circulating velocity is same as the light speed.

$$v_c = \mu_0 \omega_0 = c \quad (4)$$

As the space expands, the radius  $\mu_0$  is unchanged, the frequency  $\omega_0$  decreases, and the number of spacias increases. The light speed  $c$  also decreases as  $\omega_0$  does. Let  $m_\mu$  be the intrinsic energy of the spacia, then the energy of the spacia is given as follows.

$$E_\mu = m_\mu v_c^2 = m_\mu \mu_0^2 \omega_0^2 = m_\mu c^2$$

If the cosmic radius increases from  $x_0$  to  $x$ , the number of spacias gets  $(x/x_0)^3$  times. Both  $m_\mu$  and the total energy remain unchanged then. When  $\omega_0$  is expressed as a function of the cosmic radius  $x$ , we get the following relation.

$$m_\mu \mu_0^2 (\omega_0(x_0))^2 = \frac{x^3}{x_0^3} m_\mu \mu_0^2 (\omega_0(x))^2$$

The following formula is obtained for the light speed  $c(x)$ .

$$c(x) = \sqrt{\frac{x_0^3}{x^3}} * c(x_0) \quad (5)$$

Since  $x_0^3/x^3$  is equal to the ratio of the space energy densities, this equation (5) is exactly the same as one proposed in Section 11 that is proportional to the square root of the density of the medium. In the Hubble diagram shown in Section 11, we

used the light speed  $C(x)$ , in which the cosmic radius  $x$  was used as time, that is, variation in the light location per variation in the radius.

$$C(x) = \frac{dL}{dx} = \frac{dL}{dt} \frac{dt}{dx} = c(x) \frac{dt}{dx} \quad (6)$$

It finally becomes the following formula. The radius  $x$  is set to 1 as the maximum when the space expansion stops.  $K$  is a proportionality constant.

$$C(x) = \frac{K}{x\sqrt{1-x}}, \quad (\mu_0 \leq x < 1) \quad (7)$$

By integrating this equation (7) by  $x$ , we obtained the light propagated distance  $LD$ . In this way, Eqs. (4), (5) and (7) expressing the light speed are important consequences derived from the energy circulation theory. Therefore, the agreement in the Hubble diagram between the expected values and the observed data of supernovae, which is shown in Section 11, is one of important observational evidences for the energy circulation theory.

#### **14. Realization of the dream: Answer to the dimensional mystery of electromagnetic phenomena**

The dream in the Junshin era, which was mentioned in the Section 4, now comes true. The ECT excellently explains the dimensional mystery of electromagnetic phenomena.

We can define as that the “electric charge” is the momentum in the hidden dimension H. The direction in the hidden dimension is orthogonal to any directions in the 3D space. Therefore, the angular factors disappear from the formula for a force between two momentums in H, and the force depends only on the distance. It indicates that the charge for the fundamental force in general is a vector having a direction, but for momentums in H, we can treat the charge as a scalar without having a direction. In the ECT, we defined the momentum in H as the electric charge. A proviso, since there is a direction in H, an electric charge has a plus or minus value.

A half-circle momentum of a hidden-space dimensional single circulation  $iS$  is the elementary charge  $e$ , which is said to be the charge of an electron or proton in the standard physics. When absorbed a light and energy increased, an  $iS$  prolongs and divides to plural circulations over plural spacias. There, the total value of the electric charge does not change while it disperses, and only the potential energy in the space direction is increased. We call such a prolonged circulation in hidden-space dimensions as the “elementary charge pair (eCP)”. (Additional explanation in the next section)

We define a momentum in space dimensions of a hidden-space circulation as the “magnetic charge”. It is a vector charge even in the 3D space. A force between magnetic charges is the magnetic force. A prolonged elementary charge pair eCP rotates, and shows a rotating magnetic charge. The interaction of them is duly the magnetic phenomena that we observe. (Additional explanation in the next section)

The mystery on the dimension of electromagnetic phenomena, which I raised in my Junshin era and wanted to solve even if it would take my entire life, was here successfully solved as follows:

- ✧ The fourth dimension necessary to express an electromagnetic phenomenon is one of those for the space.
- ✧ The space of universe consists of 4 dimensions, one of which is the hidden dimension. It has the size as small as that of quantum particles (neutron, etc.), and exists at any place in the 3D space with orthogonally crossing. The momentum in this hidden dimension is the electric charge.

## **15. Novel physics by the energy circulation theory**

The energy circulation theory (ECT) requests a fundamental reconstruction of existing physics. The first paper on the ECT was published in the journal, Reports in Advances of Physical Sciences in 2018. After that, important

consequences from the ECT were successively reported, and so far, the seven articles in total, subjects of which are listed below, have been published in the same journal.

1) Energy circulation theory

It is the first paper that claimed the ECT. The title is “Energy circulation theory to provide a cosmic evolution, electric charge, light and electromagnetism”. Based on the ECT, it explained the cosmic evolution, the origin of electric charge, the mechanism of light emission and speed of light, an overview of electromagnetism, etc. The light is a wave in hidden-space dimensions.

<https://doi.org/10.1142/S242494241850007X>

2) Structures and interactions of quantum particles

For each of known major particles, it showed the composition of constituent energy circulations, energy (mass), spin, and details of the decay reactions.

<https://doi.org/10.1142/S2424942419500014>

3) Galactic evolution without dark matter

The process of galaxy formation is controlled by the force acting on momentums. There exists no black hole at the center of a galaxy, nor dark matter sandwiching a galaxy, while they are expected in standard physics.

<https://doi.org/10.1142/S2424942420500048>

4) Quantum mechanics

As I will explain later, the current quantum mechanics holds contradictions and fundamental mistakes. Here, I presented the novel wave equation by the ECT. Furthermore, the wave function of a particle shows the energy distribution in the real space.

<https://doi.org/10.1142/S2424942421500018>

## 5) Gamma-ray bursts

Gamma-ray radiations (waves in hidden-space dimensions) in a gamma-ray burst are released when a galactic seed separates into two ones. At this time, gravitational waves (waves in space-space dimensions) are also released. Here I reported the details of a galactic seed separation and the formulas for the force and potential energy between the two seeds.

<https://doi.org/10.1142/S2424942421500055>

## 6) Formation of various types of galaxies

There are many types of galaxies, such as elliptic, ring, disc, spiral ones. I showed the formation of each one by simulation. For almost all types of galaxies, how to be formed remains as a mystery in the existing physics.

<https://doi.org/10.1142/S2424942422500049>

## 7) Novel electromagnetism

Based on the ECT, I defined the electric charge, electric current, magnetic charge, and so on, and reconstructed the electromagnetism.

<https://doi.org/10.1142/S2424942423500081>

Concrete explanations on these new physics based on the ECT are posted on the following website. The content is a bit technical, including mathematical formulas, but please refer to it if you have any interest.

“Capricious walk to physics – ECT”

(Explanation of ECT)

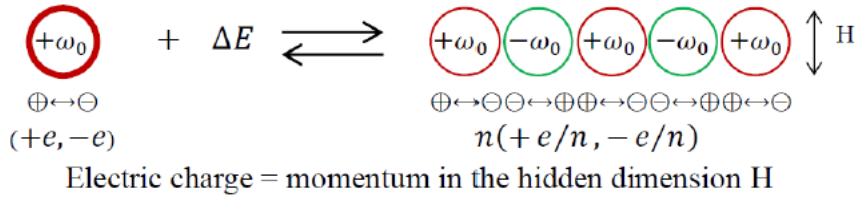
<https://mitiempo-ect.main.jp/paseo.html>



As an example of a new physical concept, let me briefly explain the electric force, electric current and magnetism by the elementary charge pair eCP in the following sections.

## 16. Elementary charge pair eCP

As mentioned in the previous section, when an energy is added by light to an elementary hidden-space dimensional circulation  $iS$ , it prolongs to plural ( $n$ ) circulations over  $n$  spacias (Fig.9). We call it as the eCP (elementary charge pair).



**Figure 9.** Prolongation of a hidden-space circulation  $iS$

By the addition of energy, the potential energy in the space dimensional direction increases, but the total value of the momentum in the hidden dimension, that is, the electric charge does not change. The force in each one circulation to the space direction is given by the following formula.

$$F_x = K_e \frac{(e/n)(-e/n)}{(2\mu_0)^2} = -K_e \frac{e^2}{(2n\mu_0)^2} = -K_e \frac{e^2}{d^2} \quad (8)$$

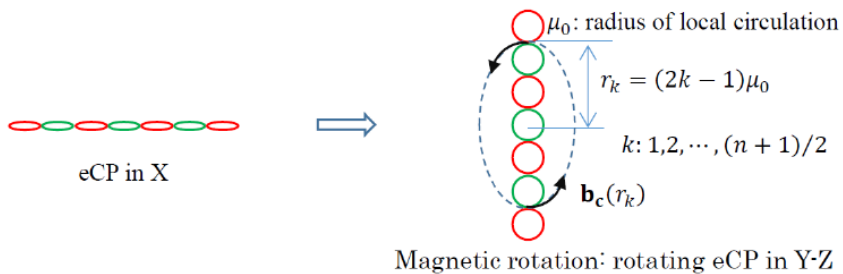
$e$  is the elementary charge and defined as the momentum of a half circle.  $\mu_0$  is the radius of the spacia. At each adjacent part of two circulations, the outward and inward forces by the intra-circulation force cancel each other out, and the force becomes zero. The force of Eq. (8) remains only at the two ends of an elementary charge pair. As shown in the equation, this force is equal to that between the virtual charges  $+e$  and  $-e$  with the distance  $d = n \times 2\mu_0$  (the length of eCP). This is the true figure of the electric force between an electron and a proton. Both the charges  $+e$  and  $-e$  are dispersed between the electron and the proton, and the elementary charge  $e$  is the sum for the entire eCP. The electron is the minus end of eCP, where a neutrino is attached, and the proton is the plus end of eCP, where a space-space single circulation is attached (proton also contains other circulations). I named the force within an eCP as the connected electric force. What the

force expressed by Eq. (8) is integrated by the length of an eCP is the electric potential energy equal to the energy of the eCP. The length of an eCP changes by absorbing or releasing a light.

$$eCP(x) + \Delta E \rightleftharpoons eCP(x + \Delta x)$$

## 17. Electric current and magnetism by eCP

Free eCP with nothing added becomes a source of the electric current and the magnetic force. An eCP can rotate around the axis of the hidden dimension H. In this case, a free eCP rotates also around the center in space dimensions as shown in Fig. 10 below. This rotation shows a rotating magnetic charge. When an electric current flows in a conductor, this magnetic rotation is relayed in sequence, exhibiting a rotating magnetic charge around the current. The interaction of these rotating magnetic charges is the magnetic force that we observe.



**Motion** in **space** dimensions: **Linear** vibration in X  $\Rightarrow$  **Helical** in XY-Z

$$V_{major}^2 + V_{local}^2 = r^2 \omega^2 + \mu_0^2 \omega_x^2 = c^2$$

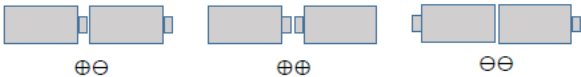
**Figure 10.** Rotation of an elementary charge pair eCP

The current electromagnetism argues that the electric current is a propagation of electric charges through movements of electrons. However, it is wrong; the energy of eCPs (polarization energy) is propagated by relaying magnetic rotations. The total electric charge of an eCP is zero, and the electric current is the propagation of the energy of eCPs, not a propagation of electric charges.



Besides, the elementary charge  $e$  is not the smallest unit but is the maximum value of the electric charge. The electric charge at two ends can interact with that of other eCP, but its value is so small as  $e/n$ , where  $n$  is over  $10^4$  in an atom. In a normal observation of a macroscopic scale, isolated electric charges do not exist. I think many people would argue that this cannot be the case, but there is a definitive example. It is said that in a battery, positive charges are gathered at the cathode, and negative charges are at the anode. If this were correct, when the electrodes of two batteries are brought close, an attractive or repulsive force should have worked. However, in fact, no matter how close they are put together, no force is observed. This fact strongly supports the idea that only the energy of eCPs is stored within a battery and there is almost no charge at the two electrodes. (The reason why hairs stand up with static electricity is explained in the Section “3-4 Magnetic interactions of charged bodies” of [“Novel electromagnetism by ECT”](#).)

Between electrodes of different cells, we **cannot** detect a force. **Critical**



**Figure 11.** Electrostatic force between electrodes of two batteries

In the current electromagnetism, the electric current is defined as the electric charge that passes at a cross section in one second. However, it is in fact the propagation of the energy of eCPs, which is an electric potential energy by polarization. Currently the energy propagated per second is expressed as the power  $P$  with a unit watt  $W$ . There is no problem if a power is expressed in watts, but it is incorrect to express it in ampere volt  $AV$ , which is the product of an electric current and an electromotive force (voltage). In the ECT, the polar charge  $c_p$  is defined as the passing energy  $U$  divided by  $U_0$ , the energy of  $iS$ , which is the smallest eCP. Then the polar charge passing in one second is defined as the electric current  $I_p$ . They have a direction plus or minus.

$$\mathbf{I}_p = \frac{\mathbf{C}_p}{t}, \quad I_p = \frac{C_p}{t} = \frac{U}{U_0 t} = \frac{P}{U_0} \quad (9)$$

We call the minimum unit of the structure of conductor as the unit line, the power of which is defined as the current potential  $V_c$ . For a conductor made of a bundle of  $m$  unit lines, the power  $P$  (in watts) has the following relation.

$$P = mV_c = I_p U_0 \quad (10)$$

Around one unit line, a rotating magnetic charge shown in Fig. 9 appears. This magnetic charge is dispersed from the center to the end, and shows a disk-like distribution. However, macroscopically, we can regard that the sum of the rotating magnetic charges (called as the gross magnetic charge) lies on the end circumference of the eCP. In a conductor consisting of  $m$  unit lines, each unit line has the same gross magnetic charge, but inside the conductor, magnetic charges cancel out and become zero, leaving magnetic charges only on the surface. To show only the results, the surface density of gross magnetic charge  $\beta_s$  is expressed by the following formula.

$$\nabla \times \beta_s = \frac{m_0}{2\pi c} \omega \frac{\mathbf{I}_p}{m} \quad (11)$$

$\nabla \times$  is a mathematical symbol called rotation, which indicates that there is a magnetic charge in the direction of rotation around the electric current  $\mathbf{I}_p$ .  $\omega$  is the rotating velocity (frequency) of eCPs, and varies by the material of the conductor. Since the number  $m$  of unit lines corresponds to the cross-sectional area of the conductor,  $\mathbf{I}_p/m$  is an electric current density. Eq. (11) corresponds to the following equation in the standard electromagnetism, where  $\mathbf{H}$  is the magnetic field, and  $\mathbf{j}$  is the electric current density.

$$\nabla \times \mathbf{H} = \mathbf{j} \quad (12)$$

## 18. Mathematical bankrupt of modern physics

The theory of relativity, quantum mechanics, and particle physics, which were proposed one after another in the early 20<sup>th</sup> century, are called as modern physics, in contrast to former ones such as Newtonian mechanics

and electromagnetism. These are regarded as absolute by physicists, and many are studying in the expansion of them. However, while the grounds and foundations of them had not been sufficiently discussed, they were accepted as correct. This is a situation where a theorem is used as unconditionally correct without proving it. I explained the contradictions and mistakes of modern physics in detail in the “Modern physics full of mistakes” with the below URL in my website.

<https://mitiempo-ect.main.jp/ModernPhysics.pdf>

Let me introduce some parts of them related to mathematic concepts.

For the theory of relativity, as explained on the pages 17 and 18 of this book, the law of constancy of the light speed, which is the premise to start, is wrong. The obtained results cannot be applied to physical phenomena because they are developed from a wrong premise as a real physical object.

Schrödinger is one of those who succeeded in formulating the quantum mechanics. Based on the de Broglie hypothesis that any particle is accompanied by a wave which can be expressed as similar to light, he proposed an equation to give the accompanying wave (matter wave). This is the Schrödinger's wave equation. Although there are some contradictions and problems in deriving this equation, it is basically the same form as the wave equation that I obtained from the ECT. The only difference is the mass in the formulas; that in the Schrödinger equation is the mass of each particle, and that in the wave equation by the ECT is the mass of an energy quantum which is the energy of one cycle of an elementary single circulation and depends on its linear velocity. Solutions of these equations are wave functions. It sounds difficult, but express a circulation in 2D by cosine and sine, then make it linearly move and express it by 3D, then we get a wave function. In this kind of differential equation, no matter what the amplitude is, any multiplied wave functions of a solution are also a solution.

Furthermore, the sum of a solution and another one in an arbitrary ratio is also a solution.

Here, the standard quantum mechanics made a big mistake. It claimed that all solutions of the equation were possible as a desired matter wave. Mathematically, when “the desired wave function is a solution of a certain wave equation” holds true, “a solution of the wave equation is the desired wave function” does not necessarily hold true. The set formed by the wave function solutions is a larger set that includes the set of the desired wave functions. The standard quantum mechanics ignored this mathematical principle, and claimed that all solutions of the equation were what were sought. It went on to claim that a particle existed in a state of superposition of numerous wave functions. It went further out of control and claimed that the equation was more fundamental than its solution. It argued that a concrete wave function was selected when a particle was measured. In order to justify such a non-mathematical and non-physical interpretation, they launched the probability interpretation claiming that “the sought wave function does not indicate a distribution of real entities such as charge or energy, but indicates a distribution of existing probability”. Because it is a probability of existence, the amplitude of a selected final wave function shall be adjusted to one, which is called as the normalization.

In the ECT, the wave function shows a distribution of the intrinsic energy of an elementary energy circulation. It is a circular motion if the particle is static, and becomes a helical motion if it is moving. The wave function is a solution of the wave equation, but its amplitude is limited to  $\mu_0$ , which is the radius of the spacia. The frequency of the wave function is determined only by the speed of the linear motion, and is unrelated to the type of a particle. The wave function of a desired particle is obtained not by solving the equation but as the sum of the wave functions of the constituent elementary circulations.

The combination of such a wrong interpretation of the quantum mechanics and the gauge theory made the particle physics more chaotic. Let me explain the gauge theory briefly below. For more details on the problems of the gauge theory, please refer to “Modern Physics full of mistakes” with the below URL.

<https://mitiempo-ect.main.jp/ModernPhysics.pdf>

When we express the state of a combination of particles as a matrix and seek the symmetry for a unitary transformation corresponding to a rotation of the matrix elements, it becomes necessary to introduce a field called a gauge field. In a gauge transformation, a force acts based on the gauge field, and the quantized gauge field is a gauge boson, which is the particle mediating the force. The electromagnetic force is said to be generated from the symmetry of the gauge transformation called  $U(1)$ , and its gauge boson is said to be the photon. It is said that the  $SU(2)$  symmetry produces the weak force, whose mediating particles are three types of weak bosons, and that the  $SU(3)$  symmetry produces the strong force, whose mediating particles are gluons (8 types). The standard model of particles requires the symmetry of  $U(1) \times SU(2) \times SU(3)$ , and tries to find a gauge field that satisfies the conditions for each gauge transformation, and express it in the form of a Lagrangian.

The unitary group of each gauge transformation has its own unique algebra. In general, various groups have their own algebras that consist of their own axioms and operations. For instance, for the group representing all vectors, it is first necessary to define what a vector is, which becomes an axiom. Then, we will define the operations such as addition and product in the group. If an object satisfies the axioms, it can be regarded as a vector even if it does not look like at first glance, and the algebra of this group can be applied to it. However, in the gauge theory of particles, the group elements that represent elementary particles are not defined. Without a

definition of the elements, the operations on them are being expanded. The wave function that is said to show the distribution of the existence probability of an elementary particle is not given, either. A composition of elementary particles is listed in a matrix, with 1 indicating that it is present and 0 indicating that it is not present, then the decays and interactions of particles are being developed. Things like particle creation operators and annihilation operators are introduced too conveniently.

The use of a unitary transformation algebra for undefined elements is mathematically bankrupt. Without specifying what kind of a particle, they are, the 17 types of elementary particles are used as the elements of a particle composition.

## 19. Epilogue

I put aside the existing physics for the time, and started examining the physics from scratch. After it dawned on me that there might be a force that acts on momentums, I proceeded using a mathematical method to set the premises first then demonstrate what can be derived from them. However, I was not aware of using such a mathematical method, but it happened unconsciously. This would have come naturally to me, since the doctrine that “what is the mathematics?” by Hirao-sensei in my Junshin era was penetrated in me.

I learned physics and chemistry from Sakata-sensei, and asked myself “what is the fourth dimension necessary to describe the electromagnetic phenomena?” when I was in high school. At the time, I thought that it would be impossible to solve this problem even for my whole lifetime. 50 years later, as if a miracle, the idea that there is a force acting on the movement of energy dawned on me. Then, I examined using the logic of mathematics, and have succeeded to construct a completely new physical system that rewrites the existing physics. It has turned out that the

dimension required to describe the electromagnetic phenomena is one of four dimensions for the space.

Physicists are actively ignoring the ECT. The ECT is not accepted except for a very small number of people. However, so far no one has been able to object to it. Many researchers around the world are trying to get closer to the real nature of the universe or elucidate the fundamentals of matter with spending enormous amounts of expense. However, most of the unsolved problems they are trying to solve have been clearly explained by the ECT. Despite such achievements by the ECT, why do physicists not reexamine the foundations of the existing physics? I wonder if the day will come when they will realize that they are swallowing what are mathematically bankrupt as being verified.

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Posted in Books on the ECT

<https://mitiempo-ect.main.jp/books.html>