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Dark energy is in front of your eyes!

Nimit Theeraleekul B. Eng. (Communication)
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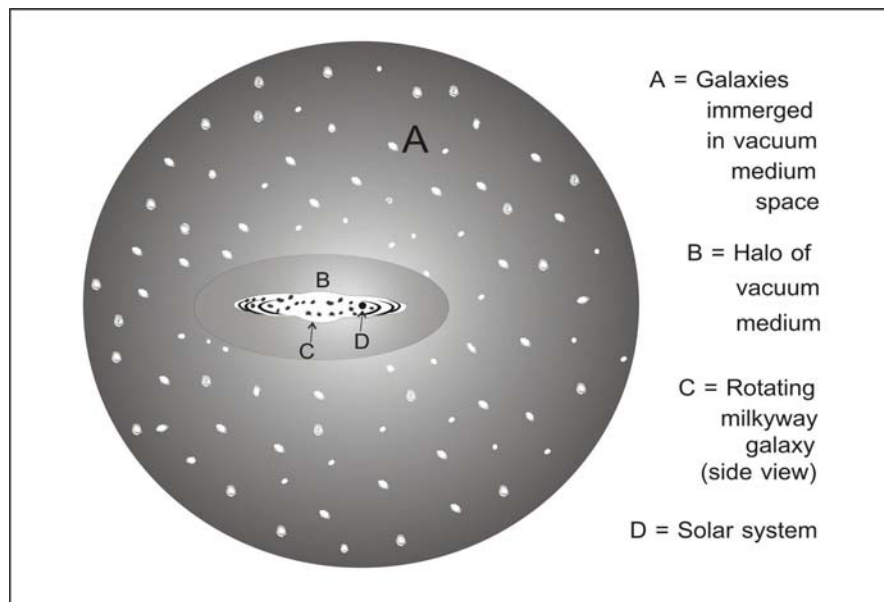
Dark energy & matter seem to be today's most hot issue in cosmology. And nowadays, cosmologists still **do not know what it is!** Why it is so mysterious and what prevent them from finding it? Actually, we could easily found it by looking back and **reconsidering** Einstein general theory of relativity which is the **foundation** of modern cosmology!

1) Anyway, before finding out for the dark energy & matter itself, we should recall how the word "dark energy" and "dark matter" were born in cosmology. First, we start with cosmologists which found that nowadays our universe is expanding! But when they make some calculation by using the conventional (non-ether based) general relativity (without the cosmological constant) and found that **dark energy** is needed to give enough **mass density** to do the acceleration expanding of our universe.

2) For dark matter, cosmologists found that all galaxies have an abnormal rotation in which their orbital rotational velocities do not obey **Newton law of gravity**; i.e. the velocity should **decrease** while the distance from the center **increases**. Instead, galaxies orbital rotational velocity is **uniform** for any distance from their center. So it seems as if there is something like **a halo of dark matter** of the galaxy!

By the way, some cosmologists have try to explain the galaxies rotation problem by invent "**modified Newtonian dynamics (MOND)**" theory, but it is not so successful! Here, we will see how the reconsideration of Einstein general theory of relativity could **lead to solve** the dark matter problem.

3) Let us start with what which we will be called it as "**vacuum medium universe**" as show in the diagram.



[Note: we have to stress here that this is not a true scale diagram, i.e. the actual distance between galaxies is very very much bigger than their sizes (later we will refer to it).]

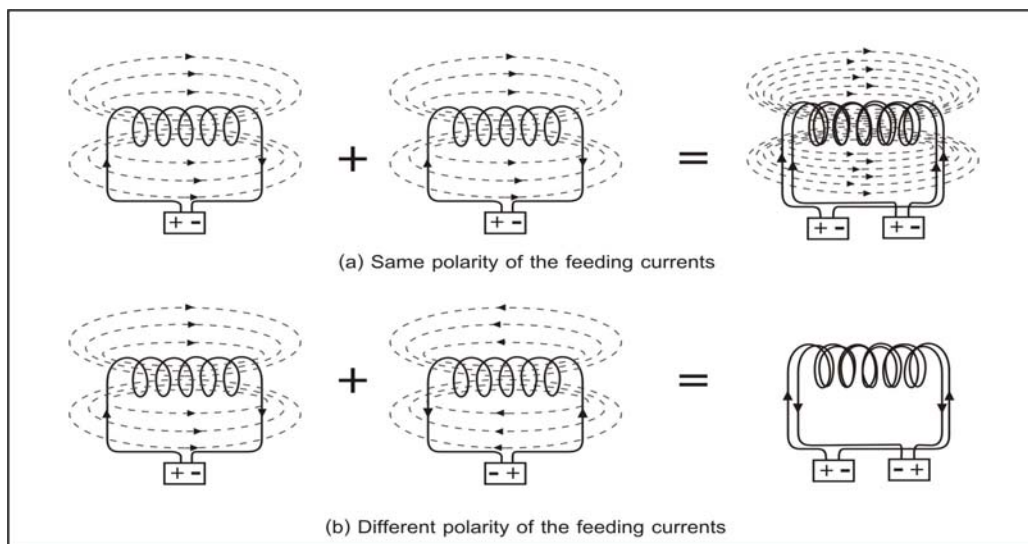
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Actually, the new universe is almost the same thing as the traditional one. The crucial different is that it is not the observable matters floating in **empty vacuum** space, instead, all the matters is immersed in physical **vacuum medium** space!

Someone may ask; are we going back to the old ether? The answer is **yes** and **no**! Yes, we are talking about something like the ether, but **no**, it is not something which fills the empty vacuum space, instead it is **vacuum space itself**!

4) Our new concept is that **vacuum medium** is the **infrastructure** of our universe; we may say that the universe was created from vacuum medium energy! While the existing of vacuum medium is positive energy, its intrinsic gravity (i.e. internal contraction force energy which holds every infinitesimal parts together) is negative energy. Then the **conservation** of the **total energy** of our universe was **preserved**! (Please see detail in "A new approach to the theory of everything", VMTE.)

Again, someone may argue that we still having the problem for **proving the existence of the ether** such as in the Michelson-Morley experiment doesn't it? Here, please do not bother about it because now we have an **obvious** simple scientific experiment which will show that vacuum medium (our new ether) is existed as follow.



The concept used in this experiment is an fundamental physics; **it is about the magnetic field B generated by a direct current flowing in a solenoid** as show in the diagram and according to the formula,

$$B = \mu n i \quad [\text{Where } \mu \text{ is the permeability constant, } i \text{ is the feeding current and } n \text{ in number of - turns.}]$$

When both two identical solenoids are feed with the same amount and same polarity of direct currents as in (a) then **the sum of the generated magnetic field is double**. But when the feeding currents are opposite as in (b) then the sum of the generated magnetic field is **zero**!

5) Someone may say that it is just the superposition of **magnetic field** vectors. Yes it is, but this is not an abstract mathematical operation (addition and subtraction). Instead, it is a real superposition of magnetic field **energy**. And the crucial point in case (b) is, **where is the generated energy gone**?

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While we still feed the same amount of energy into both solenoids, so the created magnetic energy can not be destroyed because it means that we **can violate the law of conservation of energy!** The only one sensible explanation is that there is a **cancellation** between the opposite phases of internal rotational stress in vacuum medium space. So this could be an indirect prove that there is vacuum medium in empty vacuum space, isn't it?

6) Up to now, we may say that we have proved the **existence of vacuum medium!** Then, what is the relation between vacuum medium and dark energy? Actually, they do not **only** relate to each other, instead both of them are the **same thing**, but why? And before answering the question, let us summarize about what we have talked about vacuum medium.

First we have said early that vacuum medium is the infrastructure of the universe's space, or we could say that **the vacuum medium is the raw material** builds up our universe - **vacuum medium universe!**

Second, as mentioned before that vacuum medium have **gravity energy** (internal contraction force) as its intrinsic property, which is contrast to conventional matter that said nothing about the attraction between materials mass! So vacuum medium **is primordial substance** which is also the origin of all kind of materials mass in our universe!

Third, in some more technical detail, vacuum medium is a **uniform, transparent** and **continuous medium** which have a peculiar mechanical property. It is very thin in mass density ($23.3 \times 10^{-28} \text{ Kg/m}^3$) so it is **permeable by all matters** almost without any observed resistance. But it has very **large elastic coefficient** and sensitive to shear force (rotational force) while not to compressive or longitudinal force!

7) Here is detail of the dark energy; First, we start with cosmologists' calculation by using the conventional (non-ether based) general relativity (without the cosmological constant) and found that **dark energy** is needed to give the **critical mass density** for do the acceleration expanding of our universe.

Second, if we made a calculation from **vacuum medium** - based general relativity with the cosmological constant, what we got is the **same thing as the critical mass density!** (Note that actually the cosmological constant term is the representing of our vacuum medium's mass density.)

(Someone may wonder why the **tiny mass density** of vacuum medium having so **much accelerating pressure** for expanding of the universe. The answer is because the universe's size is very, very huge (compare with galaxy as mentioned early in the first diagram of vacuum medium universe), so the total mass of vacuum medium is also **very, very large** (compare with the total of galaxies' mass and other observable mass. But on the contrary, for the scale of galaxy's size, the vacuum medium has a negligible effect on it.)

Third, another crucial property of vacuum medium is that it has a **negative pressure** which was required to make acceleration expanding of our universe according to the concept of the dark energy. So by comparing 5) and 6) we could see that actually **vacuum medium is the same thing as the dark energy**, couldn't we?

8) Now it is interesting to compare between the **conventional** (non-ether based) general relativity and the **vacuum medium** - based general relativity which was the improved one (and I have called it as "Completed Einstein general relativity", CGTR). Actually, both of them are nearly equivalent, except that the vacuum medium - based theory included the **cosmological constant!**

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While the non-ether based theory has **zero value** of cosmological constant and it was based on empty space, but the vacuum medium - based one has a definite value of mass density which is the **same order as** the critical mass density. (Please see detail calculation in CGTR). In one view we can treat the cosmological constant as **ambient mass** filled empty vacuum space, and actually this ambient mass **is the mass density of our vacuum medium!** But why?

Two reasons which support that **our** vacuum medium is the ambient mass of the **cosmological constant** term. First, both of them have approximately **the same mass density**; the second reason is that vacuum medium has a negative pressure which was required to be the solution of the **full field equation** of **conventional** general relativity (used for calculating the critical mass density)!

So we could see that actually our **vacuum medium, cosmological constant** has the **same property as** the **requirement** of the **dark energy**. It is very interest that this correspond to the idea of Frank Wilczek (a Nobel Prize winner in physics 2004) which has said in his recent book - "**The Lightness of Being** (Mass, Ether, and the Unification of forces)"!

9) Up to now we have found that actually the dark energy is the vacuum medium, but what about dark matter is also the same thing as the vacuum medium? May be it is not easy to conclude so because we just said that for the scale of galaxy's size, the vacuum medium (as dark energy) has a **negligible** effect on it, then how could the medium could has a **significant** effect on galaxy as the **dark matter**? The answer is because the effect of **galaxy's rotation** affect on the vacuum medium around!

As we have mentioned early that vacuum medium have a **peculiar mechanical property** which is uniform, transparent and continuous medium, but with very thin in mass density. In other side, it has **very large elastic coefficient** and sensitive to shear force (rotational force) while not to compressive or longitudinal force!

The obvious evidence which manifest the vacuum medium's property mentioned is the nature of electromagnetic field which was shown in detail in "Completed Maxwell electromagnetic field theory", CEMT. Specifically for the **rotational dragging effect** of vacuum medium by galaxy's rotation which is then create the **action of shear stress** within the vacuum medium!

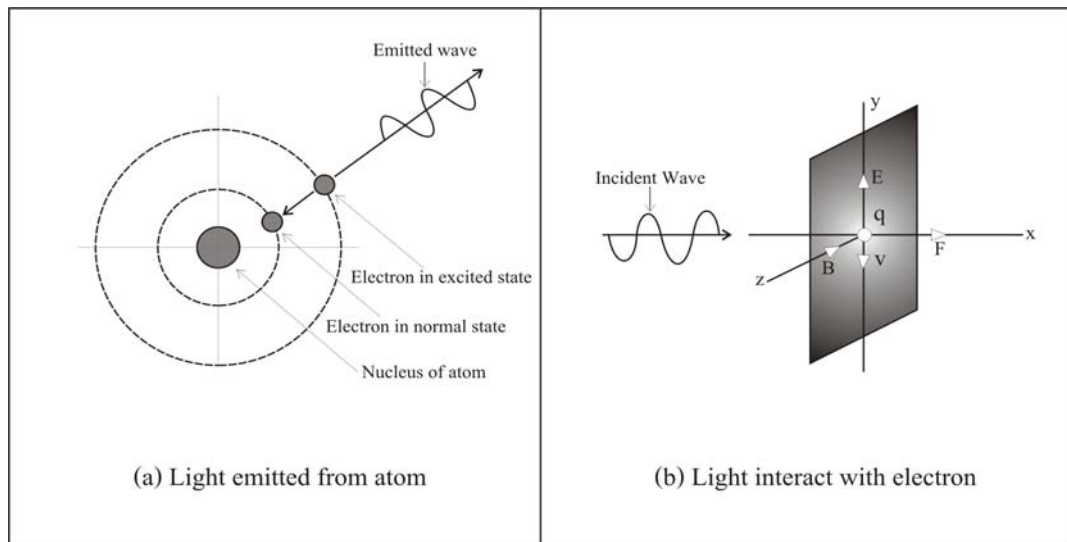
According to the stress action in any very large elastic coefficient medium, it means that large **stress energy** was created in the medium. Then **galaxy's rotation** creates a huge **stress energy** which is then makes the galaxy's **abnormal orbital rotational velocity** as if there is a large halo of matter around. So we can conclude that the large **stress energy** vacuum medium is acting as what which we called it as the **dark matter**, can't we?

10) Finally up to now we have found that actually the dark and dark matter is the same thing as the vacuum medium which exists in everywhere around us. Also we indeed could see it in front of our eyes! Below is more detail explanation.

Believe it or not! Actually, nowadays we still do not clear **how light wave - packet (photon) was created!** And it is easy to start talking about it by using the conversation between Richard P. Feynman and his father in "The Physics Teacher" (September 1969) about light as follow;

[My father] said, "I understand that they say that **light** is emitted from an atom when it goes from one state to another, **from excited state to a state of lower energy.**" I said, "That's right."

"And light is a kind of particle, a photon, I think they called it." I said, "Yes."



“So if the photon comes out of the atom when it goes from the excited to the lower state, **the photon must have been there in the excited state?**” I thought a few minutes and I said, “I am sorry; **I don’t know. I can’t explain it to you.**”

10) What we learnt from the conversation is the knowledge that we do not know **how light is created!** And we could that under the concept that “**vacuum space is empty**” it is impossible to explain how. Instead if we accept the concept “**existence of dark energy (vacuum medium)**”, it is easy to understand how light is emitted!

Now, we could explain **how light is emitted from an atom** by using vacuum medium wave. In diagram (a), when an **electron** (in an atom) was hit by a photon (or any other kinds of electromagnetic waves which energy is big enough), it will move from **normal state** of lower energy to **excited state** of higher energy.

After the collision, the excited electron will jump back from unstable excited state to its normal lower stable state immediately. Because the “**transition time**” is very short, then the jumping back electron will transfer its **impulse** force’s energy to the surrounding **vacuum medium**. So it makes the disturbed vacuum medium oscillates and radiate out as a “wave - packet” or **photon** as shown in (a), this is the **mechanism of light wave** i.e. the **action of the dark energy!**

Lastly, in our daily live, light was originated from object’s atom and then collide with air’s atom of the atmosphere in front into our eyes; this is what we perceived when looking at the object! **In final summary we could say that dark energy and dark matter is the same thing i.e. vacuum medium which exist in everywhere around us and up to anywhere in our universe!**

Note: This paper was written by reference to the author’s other articles i.e. Completed Einstein general relativity, A new approach to the theory of everything, A realistic theory of everything and Completed Maxwell electromagnetic field theory. All articles are now presenting in this website (www.vacuum-mechanics.com).

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