

Advances in Exploration of Dark Energy: *Modern Physics and Christian Faith*

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ABSTRACT

The presented conference lecture provides a theory of dark energy that appears to have been developed in two complementary ways. On the one hand, this theory is based on physics and mathematics and, on the other hand, it is developed on the basis of available data. This corresponds to the discovery of the laws of planetary motion in elliptical planetary orbits by JOHANNES KEPLER in the past. He developed his laws from a large amount of data. Later it was theoretically substantiated more thoroughly by ISAAK NEWTON. The focus is on deriving a formula for the equivalence of energy and time (1), page 2. Precursors to the presented “Theory of Dark Energy” were published in the articles [1-11].

The derivation of the formula for the equivalence of energy and time provides new theoretical insights and applications in theoretical terms. These are listed in “Application” and “Future research fields” sectors;

This derivation leads to the discovery of a new law of nature. This is explained in section “Conclusion”.

The “Foundations of a Dark Energy Theory” was first mentioned in my previous work “Commentary about Calculation of Dark Energy and Dark Matter”, published in *Journal of Physics and Astronomy* (i Scholar), Vol.11, No.10, May 2023., pp. 346-347. The presented article “Theory of Dark Energy” is now completed and a theoretical physical-mathematical derivation of the formula (1.2) is provided.

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Introduction

This lecture provides contributions about dark energy and leads to a discovery of a new law of nature. Following aspects will be shown:

- contributions about the nature of time
- the current state of knowledge about the relationship between faith and science
- natural laws from a biblical perspective

The focus of my topic is on deriving a formula that expresses the “Equivalence of Energy and Time” or “Equivalence of Dark Energy and age of the universe”.

Applications of the formula, I will show you, could be made to answer open questions in theoretical physics and give concrete examples of such applications (see “Application” sector).

Biography

- Friedhelm Manfred Jöge, born in 1943, worked in a scientific laboratory after studying chemical and mathematical textbooks at a young age and after studying chemical engineering at the Nuremberg University of Applied Sciences,
- 1966 Diploma (FH) Chem. He then worked in development departments in the chemical and pharmaceutical industries
- Employment in other organisations working in the fields of biochemistry, medical studies and pharmacy

- Employment in the Institute of Solar Energy Research (ISFH) in the field of optimization of microcrystalline silicon surfaces and electron microscopic images (REM)
- 2010 Starting with research in Dark Energy

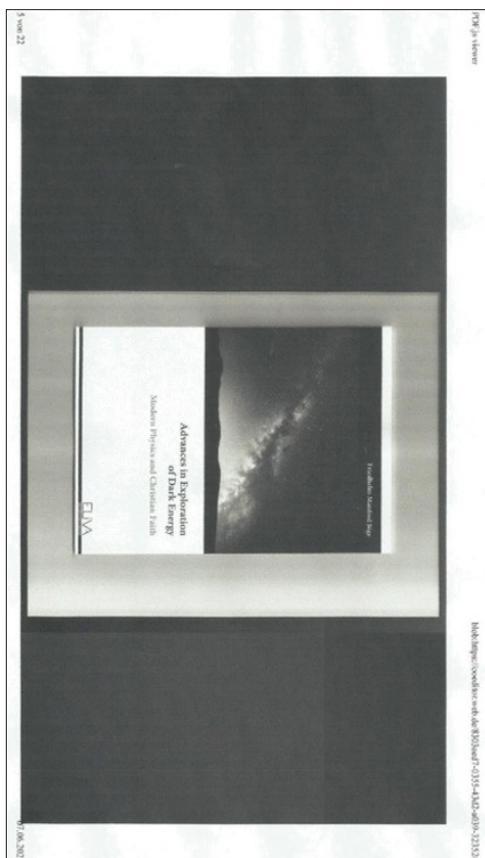
The focus of his work was in the field of biochemistry and macromolecular chemistry

His interest are the synopsis of various physical, chemical and biological knowledge as well as questions of origin of life and ethics in the field of tension between faith and science. In particular, he dealt with the concept of information.

He is married, has a daughter and three Grandchildren. He loves music and chess.

His most important contributions to scientific are articles:

1. Quantum Gravity
2. Theory of Dark Energy
3. Calculation of Dark Energy and Dark Matter
4. Equivalence of Energy and Time
5. Time is Energy and Dynamic Information
6. Information & Effect: An Introduction to the Concept of Immanence as a Physical Quantity



Theory of Dark Energy

The presented article provides a theory of dark energy that appears to have been developed in two complementary ways. On the one hand, this theory is based on physics and mathematics and, on the other hand, it is developed on the basis of available data.

A formula for calculating dark energy was developed in my previous article published in the International Journal of Physics and Astronomy [1]. It is:

$$E_d = (h/t_p^2) \cdot t_u \quad (1.2)$$

E_d = dark energy t_u = age of the universe h = PLANCK's quantum of action t_p = PLANCK time, represents an oscillation period τ

The development of formula (1.2) is based on a single idea; namely the question:

“What kind of energy is it when you divide PLANCK's quantum of action by PLANCK time”?

The derivation of formula (1), page 2 for the “Equivalence of Energy and Time” [3] requires only the assumptions that the PLANCK time t_p is an oscillation period τ and dark energy satisfies the PLANCK / EINSTEIN formula

$$E = h \cdot \nu$$

Oscillations are fundamental oscillations of a cosmic space [4 pg.15]. THOMAS GÖRNITZ says:

“Structural quanta emerge from a quantum-theoretical description of “oscillation states” of a system around its ground state. They produce many effects. The AQIs of protyposis are also structural quanta and not particles. One can interpret them as the “fundamental oscillations of the cosmic space”.

First way

Physical-Mathematical and Theoretical Derivation

For the equivalence of energy and time leads to:

With $\nu = 1/\tau$, you get

$$E = h/\tau$$

With $\tau = t_p$, you get

$${}_pE = h/t_p \text{ for Energy in PLANCK time}$$

$${}_1E = (h/t_p^2) \text{ for Energy in 1 s}$$

$$E = (h/t_p^2) \cdot t \quad (1) \quad \text{Equivalence of Energy and Time}$$

For the age of the universe t_u you get

$$E_d = (h/t_p^2) \cdot t_u \quad (2) \quad \text{Equivalence of Dark Energy and the age of the universe}$$

Second way

Derivation with Data

In my article “Calculation of Dark Energy and Dark Matter” [1] you can find on page 2 the derived formula:

$$E_M = c^5 / (8^{1/2} G H_0) = 5.61 \cdot 10^{69} \text{ J} \quad (2.1)$$

This formula did emerge from the BEKENSTEIN HAWKING entropy and the HAWKING temperature, see my article [1], pg.2.

In formula (1.2):

$$(h/t_p^2) \text{ is } = 2.2802 \cdot 10^{53} \text{ Js}^{-1} \quad (a)$$

$$E_d = 5.61 \cdot 10^{69} \text{ J} \cdot 70 / 4 = 0.982 \cdot 10^{71} \text{ J}$$

With $t_u = 4.3056 \cdot 10^{17} \text{ s}$, you get

$$E_d/t_u = 0.982 \cdot 10^{71} \text{ J} / 4.3056 \cdot 10^{17} \text{ s} = 2.2807 \cdot 10^{53} \text{ Js}^{-1} \quad (b)$$

The numerical values calculated using formulas (a) and (b) correspond to a high degree. This means that formula (1.2) is validated and correct. It should be acknowledged as a law of nature, so as KEPLER's laws of planetary orbit descriptions have been confirmed and acknowledged as correct from the large amounts of data available. The available data has been published by the MAX PLANCK Institute for Radio Astronomy.

Application

Applications of the formula (1.2) as natural law for experimental research or practical applications have not yet been carried out. The reasons for this are: dark energy is not yet experimentally accessible. In addition, dark energy cannot be observed directly and is diffusely distributed throughout the universe and is therefore not easy to detect. However, applications could be made to answer open questions in Theoretical Physics. The following Applications show how formula (1.2) can be used to answer open questions and give concrete examples of such applications.

In addition to four applications previously described in the article "Time is quantized" [5], "The Universe -an Open System" [6], "Dark Energy is not constant" [7], "Equivalence of Information and Squared Energy" [8] the present article "Theory of Dark Energy" also contains an application of formula (1.2). The statement of Prof. Dr. Alexandre Tkatchenko from the University of Luxemburg also contains a possible application of formula (1.2). The application in the present article "Theory of Dark Energy" should be highlighted.

The possible application in this case consists in that what Prof. Dr. Alexandre Tkatchenko says: "Accurate calculating the value of Dark Energy could help bring together two of the largest fields in physics: Quantum Field Theory (QFT) and the General Relativity Theory (ART) developed by ALBERT EINSTEIN.

Future Research Fields

The following Applications show how formula (1.2) can be used to answer open questions and give concrete examples of such applications.

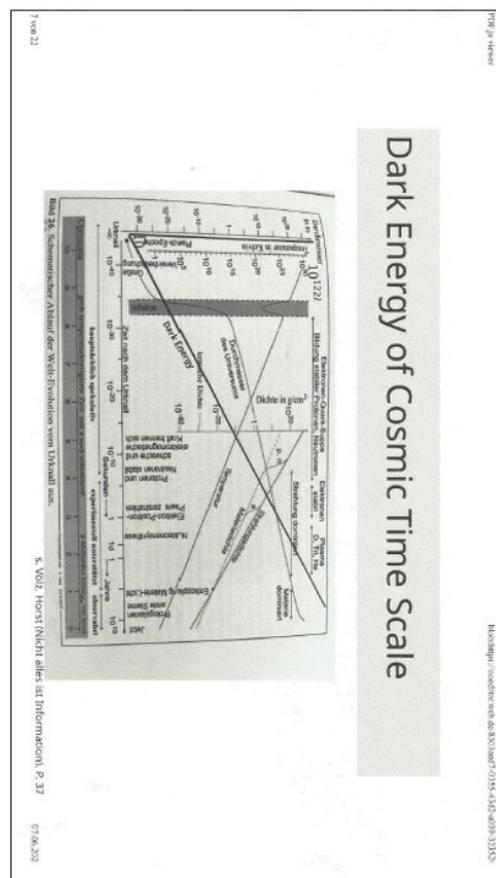
Since the dark energy is relative [9] and dark energy is not constant [7], the energy on Earth is different than the energy at the edge of the universe. What this means for the development of the universe from Big Bang to today must be researched. That doesn't matter for the Earth, but whether the linear function of dark energy depending on the age of the universe (see diagram [7]) is still valid and the exact calculation of dark energy is still correct must be reconsidered.

Another application of the formula (1.2), which was already mentioned above, is given by Prof. Dr. Alexandre Tkatchenko from the University Luxemburg.

Research into possible interdisciplinary applications of formula (1.2) could, for example, be applied in areas outside of physics, such as in cosmology or in the interdisciplinary modeling of physical systems, in future research.

Expanding the possible scope of application could open up exciting avenues for further research.

Quantum Gravity to Unification of Quantum Field Theory (QFT) and General Relativity Theory (ART)



Conclusion

The formula (1.2) is theoretically justified and validated based on available data.

It should be acknowledged as a natural law. "KEPLER's" laws of planetary motion were theoretically founded by ISAAK NEWTON ("NEWTON's" law of gravity), which he discovered and which represents a law of nature. The situation is similar when generalizing the formula for the "Equivalence of Dark Energy to the age of the universe" to the "Equivalence of Energy and Time" [3]. That is, when I say in all modesty: "This formula also represents a law of nature".

The article "Calculation of Dark Energy and Dark Matter" [1] was the first to accurately calculate the value of Dark Energy. Accurate calculating of this value could help bring together two of the largest fields in physics: Quantum Field Theory (QFT) and the General Relativity Theory (ART), developed by ALBERT EINSTEIN. That's what Prof. Dr. Alexandre Tkatchenko says. This is also a possible application.

Definition of Symbols used in formulas

- E = Energy
- E_d = dark Energy
- E_M = Energy equivalent of visible baryonic matter
- t_u = age of the universe = 13.75 billion years with 1 year = 365.2422 days (Google)
- t_p = PLANCK time h = PLANCK's quantum of action $h = h / (2\pi)$
- G = constant of gravity
- H₀ = HUBBLE's constant

ν = frequency
 τ = period of oscillation

Modern Physics and Christian Faith

Anton Zeilinger from the Institute for Quantum Information in Vienna says:
“Information and reality are one and the same with the same medal.”

Now reality is not a concept of physics, but reality could be understand as a single effect (energy sign time) or as the sum of all effects.

There are also physical-mathematical proofs that matter and energy must be identified with information. So there are the formulas:

$$E = h \cdot \ln 2 \cdot H/t \quad (1) \quad E = \text{Energy}$$

H = SHANNON's Information Entropy

$$H/t = \text{Information flow}$$

t = time
 h = PLANCK's quantum of action
respectively

$$A = h \cdot \ln 2 \cdot H \quad (2) \quad A = \text{Action, Effect}$$

Formula (1) was published by LIENHARD PAGEL in his book “Information is Energy (meaning “Dynamic Information” = Information flow) [2] and HARTMUT ISING [3] under the title “Information and Energy”.

I also derived and validated formula (2) from DE BROGLIE's formula [4]:

$$A/h = S/k \quad (3) \quad S = \text{thermodynamic Entropy}$$

where

$$S = k \cdot \ln 2 \cdot H \quad (4) \quad k = \text{BOLTZMANN's constant}$$

It is known through the Holy Scripture, the Bible, that information is equivalent to effect or information flow is equivalent to energy. Christians have always known that through God's speaking everything came into the world, the entire universe (creation), both energy and thus matter as well as life. “God spoke and it came to pass ... they stood there” (Isaiah 48:13).

Formula (1) can make a contribution to this. The moment God spoke; he brought energy into the world through this flow of information. He also sustains the world through his constant speaking. Physics and mathematics therefore provide a very good foundation for the credibility of the Bible's statements. Jeremiah 23:29 says: “The Word of God is like a hammer that breaks the rock. There is also a reference in the Gospel of John 1:1-3 (In the beginning was the Word) that matter also emerged from God's Word (verse 3).

Although physicists have also-called “Standard Model of Physics” that is support to explain the emerge of the entire universe, they didn't know where the energy came from and how the energy came into existence.

Christians know from the Holy Sripture, the Bible, that this happened through God's speaking.

The Gospel of John 1:14 says: “And the Word became flesh ... “ (Word is certainly Information and flesh is certainly matter, even if that is to be understand more spiritually). Many characteristics of matter that have been found and continue to be found can be identified with information.

Compatible View of Information and Natural Laws from a Scientific and Biblical Perspective

Proposed definition of Information

A general proposal for a definition of information in compact terms that could be valid for all scientific disciplines in the age of language confusion in relation to the concept of information would be:

“Information is the composition of an ensemble of symbols of a certain sequence” (Friedhelm M. Jöge)

This definition includes all essential aspects of the concept of information such as statistics, syntax, semantics and pragmatics. The formulation “certain sequence” refers to semantis and, inextricably linked with that, to pragmatics (*semanto-pragmatics*). Likewise, the phrase “composition of an ensemble” refers to statistics, where the terms “probability of a composition” and “canonical ensemble” are used.

The statistics is useful for the formulation of physical-mathematical formulations.

Principle of Information Formation

“Universal Information can only be generatrd by an intelligent transmitter” (Werner Gitt)

12. This is the result of a new detailed study. Researchers from the University Bonn evaluated images from the HUBBLE's Space Telescope together with colleagues from the US- universities of Stanford and California.

The Highlight

Your calculation takes more factors into account than previous studies. Their value for the age of the universe is therefore particularly close to reality. The results will soon be published in the trade magazine “Astrophysical Journal”.

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