



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

**INTERNATIONAL JOURNAL
OF CURRENT RESEARCH**

International Journal of Current Research
Vol. 14, Issue, 02, pp.20677-20682, February, 2022

DOI: <https://doi.org/10.24941/ijcr.43071.02.2022>

RESEARCH ARTICLE

ABOUT SHAWYER'S THRUSTER

***Anatolii Pavlenko**

Open International University of Human Development "Ukraine", Ukraine LLS "Spinor International", 1, Sviatoshinska sq., Kyiv, 03115, Ukraine

ARTICLE INFO

Article History:

Received 24th November, 2021
Received in revised form
15th December, 2021
Accepted 20th January, 2022
Published online 25th February, 2022

Keywords:

Shawyer's Thruster, Physical Vacuum, Torsion field, Interaction of torsion fields.

*Corresponding author:

Anatolii Pavlenko

ABSTRACT

The article is intended for people interested in research in such areas as physics (engines for interplanetary travels, interplanetary flights, torsion field, quantum correlation, cavity structures). This article does not contain many complex mathematical formulas and technical terms, because it is very difficult to describe the state of the Physical Vacuum and the behavior of virtual particles. Roger Penrose, Nobel Prize laureate, points out that this new, as yet absent theory, must be "uncomputable". It is believed that quantum particles are objects in much the same way as classical ones. This similarity provides an important continuity between classical and quantum physics. We believe that there is value in making research accessible to specialists in various fields - which is really the point of our publication. It is intended for readers with a college degree.

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Citation: Anatolii Pavlenko. "About Shawyer's Thruster", 2022. *International Journal of Current Research*, 14, (02), 20677-20682.

INTRODUCTION

NASA is an attacking player in space science, so when the agency's team discovered that "impossible microwave" thrusters were working, something very strange was definitely going on. British scientist R. Shawyer has been trying to get people interested with his EmDrive engine for several years now. Shawyer claims that EmDrive converts electrical energy into thrust without the need for any fuel by pushing microwaves in a closed frustoconical container. He built a number of demonstration systems, but critics dismiss his theory and insist that, according to the law of conservation of momentum he can't work. An independent third party was required to reproduce R. Shawyer's results. As Wired.co.uk reported, this happened last year when a Chinese team built their own EmDrive and [//www.wired.co.uk/article/emdrive-and-cold-\(about-72-grams\)-enough-thrust-for-a-satellite-drive](http://www.wired.co.uk/article/emdrive-and-cold-(about-72-grams)-enough-thrust-for-a-satellite-drive). Such an engine can be powered by solar energy, eliminating the need for propellant, which takes up to half the launch mass of many satellites. The Chinese work attracted little attention; no one in the West seems to believe it. However, the American scientist Guido Fetta built his own microwave engine without fuel and managed to convince NASA to test it.

Surprisingly, the test results were positive and were presented at the 50th Joint Propulsion Conference in Cleveland, Ohio. The NASA research team titled their report "Anomalous RF (Radio Frequency) Test Device Thrust Measured on a Low Thrust Torsion Pendulum". The torsion balance they used to test the thrust was sensitive enough to determine a thrust of less than ten micronewtons, but emphasized the positive result despite the law of conservation of momentum: "Test results show that the design of the RF resonator motor, which is unique as an electric propulsion system, creates a force unrelated to any classical electromagnetic phenomenon, and therefore potentially exhibits an interaction with a quantum vacuum virtual plasma." This conclusion is an important factor that makes it possible to explain the appearance of thrust in the considered cases.

PHYSICAL VACUUM: What is the main interpretation of the Physical Vacuum or quantum vacuum virtual plasma? Let's imagine some limited space from which air is removed. Traditionally, we would say that there is nothing there, which means a vacuum. However, according to modern understanding, this is the Physical Vacuum, since this volume is not empty at all. Imagine now that we managed to remove all elementary particles from this volume and screen it so that no particles from outside could get inside.

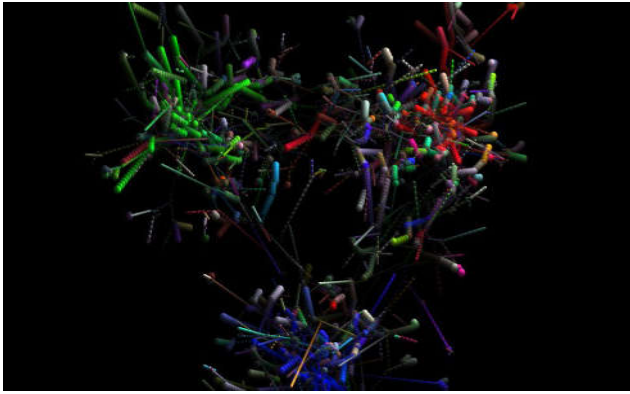


Fig.1.

But even in this case, from the point of view of modern physics, it cannot be argued that the volume is empty (Akimov, 1989). So-called virtual electron-positron pairs can appear in random places in this volume of space. Material objects, electron-positron pairs, cannot appear out of nowhere. They can only be produced by matter, and if we do not register it directly in the indicated volume from which virtual pairs arise, then it will necessarily be some specific substance that is not observed under ordinary conditions. This specific substance has been called the Physical Vacuum. In addition to the production of electron-positron pairs, the Physical Vacuum manifests itself in a number of experimental phenomena. Physicists from the laboratory of Professor Alfred Leitenstorfer found vacuum fluctuations, and access to the ground state of the quantum system was obtained without any intensification of its intensity. Until now, direct experimental observation of this fundamental phenomenon was not considered possible. They demonstrated a first direct observation of the so-called physical vacuum fluctuations by using short light pulses while employing highly precise optical measurement techniques (Fig.1).

In 1949, R. Feynman introduced virtual particles created by quantum objects to denote force fields in his diagrams. Virtual particles are elementary particles in quantum field theory, which symbolize the interaction of their counterparts, the so-called real particles. For 25 years, philosophers of physics have put forward several arguments for and against the interpretation of virtual particles as similar to ordinary objects in space and time. The article (Tobias, 2008) made an attempt to systematize the main arguments and prove that no arguments are ultimately satisfactory for understanding the reality of virtual particles. But just one counterargument - entangled state - is enough to support a realistic interpretation of virtual particles. The properties of the virtual particles depended on the interaction in which they were involved. For example, electric and magnetic interactions are accomplished by so-called virtual photons consisting of two oppositely charged virtual particles with spin (Liudmila, 2021). The introduction of virtual particles ascribed some physical meaning to the variables introduced by the variables characterized the properties of virtual particles created by the quantum object. Over time, the concept of virtual particles came to be applied to a number of physical effects, such as the spontaneous emission of photons, the Casimir effect, the Van der Waals force, the Lamb shift, and others. Numerous various manifestations of this effect made it possible to draw a conclusion about its field nature, which is not electric, magnetic or electromagnetic (Akimov, 1991; Bobrov, 2003;

Anatolii Pavlenko, 2021). In science today it is called a torsion field. There are static and dynamic torsion fields .

Shape effect: The shape effect is the property of bodies of certain geometric and topological configurations to exert a wide range of effects on the physical state of matter, the functioning of living systems, cause changes in the parameters of objects, and interact with each other (Kovalenko, 2015; Kovalenko, 2012; Yuri, 2021; Shawyer, 2013; Roger Penrose, 2004). We have established that the movement of the Shawyer engine is due to the interaction of the left torsion field of the engine and the left torsion field of the Physical Vacuum. A detailed explanation of this interaction will be given below. One of the sources of the static left torsion field of the Shawyer engine body, which is a truncated cone without a base, are virtual electrons, which were repelled by real electrons of the body, and virtual electrons exist both inside the volume of the hollow shape of its inner surface and from its outer surface (Roger Penrose, 2004). We will consider a simplified version of the occurrence of thrust in the engine without taking into account additional dynamic sources of the torsion field inside the engine, which are installed to increase its thrust force. These sources can be magnetrons or other sources of electromagnetic radiation. Electromagnetic radiation is always accompanied by dynamic torsion radiation. What is the most basic interpretation of the Physical Vacuum? A specific substance producing electron-positron pairs. Apart from producing electron-positron pairs, Physical Vacuum manifests itself in a number of experimental phenomena (13). Let's take a look at some of them. Once again, we note that for all the external heterogeneity of the examples under consideration, they have something in common: in all cases, objects in observed processes and experiments or in natural phenomena have spin, meaning classical spin, or angular momentum of rotation. We will give examples that, when analyzed together, will allow us with sufficient reason to assume the presence of specific interactions and fields generated by classical spins or angular momenta of rotations. Their properties, as follows from the above examples, indicate that if these fields exist, then they should be as universal as electromagnetic and gravitational, manifesting themselves at the micro- and macroscopic level. For example, if we have a material object, a cone or a pyramid - no matter what it consists of - metal, paper, wax, hollow or cast, etc., we fix the right torsion field above the cone, and below it - below the base - left torsion field. Today this property of the conical object is already used in practice (the Shawyer engine will be described later). Consider the process of formation of torsion fields in a cone. The law of interaction of torsion fields consisting of virtual electrons and positrons is known: like attracts like.

Any material object has its own torsion field, consisting of virtual electrons, since virtual electrons are repelled by real electrons located in any material object (Roger Penrose, 2004). The number of virtual electrons at the base of the pyramid is much greater than the number at the top of the pyramid, and some of the virtual electrons at the top of the pyramid are attracted by virtual electrons at the base of the pyramid, as a result of which a right field is formed above the top of the pyramid virtual positrons, and at the base of the pyramid there is a left field, which extends to 2/3 of the height of the pyramid, then there is a right field. This is the reality confirmed by measurements with a VEGA-12 (14) torsion detector and biolocation methods. There are other forms that generate a torsion field - for example, cylinders. In a short

cylinder (the diameter is more than half of the lateral side), the right field emanates from the ends, and the left one at the side. In a long cylinder (the diameter is much less than half of the lateral side), on the contrary, the left field emanates from the ends, and the right field in the vicinity of the middle. There is an explanation for this fact. By analogy with a pyramid, virtual electrons from the center of a long cylinder are attracted to the ends of this self-imposed cylinder, as a result of which a right field is formed in the middle of the cylinder, consisting of virtual positrons, since virtual electrons were attracted to the ends of the tube. The above phenomena are referred to as the "shape effect".

Shawyer Thruster: The EmDrive is a relatively simple device: It's an empty cavity that isn't perfectly symmetrical. Shawyer (Shawyer, 2013; Shawyer) claims his device works by bouncing microwaves around inside a conical cavity. According to him, the taper of the cavity creates a change in the group velocity of the microwaves as they move from one end to the other, which leads to an unbalanced force, which then translates into a thrust. If it worked, the EM Drive would be a propulsion method unlike any other, requiring no propellant to produce thrust. Scientists claim that all they say so far is that they discovered something strange and inexplicable, which may be new, but is likely an experimental artifact that warrants further study, because there is the thrust that cannot be explained by any conventional theory. As noted above, the drive consists of a truncated conical copper shell with a plastic (polyethylene) disc covering the narrow end of the truncated cone. The propulsion system is unique because the device uses no traditional fuels or propellants. Instead, in the simplest of terms, the electromagnetic waves bounce around inside the cone in a way that some say causes propulsion. If feasible, such an engine could push a rocket through space without the need to carry fuel ([//ntrs.nasa.gov/search.jsp?R=20140006052](https://ntrs.nasa.gov/search.jsp?R=20140006052)). But as many physicists have pointed out, such an engine would defy the laws of physics as we know them. To test this concept anyway, the team in Germany built an EmDrive similar to the one NASA had looked at (a leaked paper offered some details), set it inside a highly shielded vacuum chamber and fired microwaves at it. They report that while the EmDrive did experience thrust, the thrust did not appear to come from the engine itself—there was thrust no matter which direction the engine was pointing, suggesting it originated from a secondary source, possibly magnetism from the Earth. It is always a good sign when we see conventionally trained academics and engineers admitting that something is doing the "impossible" and is apparently violating the coveted laws of physics. ([//ntrs.nasa.gov/search.jsp?R=20140006052](https://ntrs.nasa.gov/search.jsp?R=20140006052)). The thrust produced is extremely small but nevertheless, it works and of course needs to be researched and developed further. We have built a new version of EM Drive thrust generation using the Physical Vacuum theory.

Appearance of thrust in the Shawyer engine (simplified version): The engine body in the form of a truncated cone without a base provides stationary polarization of the Physical Vacuum both inside the volume of the hollow shape and its outer surface. The internal field of a hollow cone without a base has a more powerful left torsion field structure than a cone with a base, and therefore it is used in the engine. Consider the distribution of the torsion field inside the Shawyer engine (Fig.2). A thin disk 1 covering the narrow end of the truncated cone is installed in the region of

the truncated part of the cone at some distance from the base, its geometry is such that it has a right torsion field in the planes and a left field along the perimeter of the disk. Disk 1 attracts virtual positrons located in region 2. The highest density of virtual positrons (Kovalenko, 2015; Kovalenko, 2012; Yuri, 2021) will be near disk 1. As we move away from disk 1 towards the bottom, the density of virtual positrons decreases and becomes zero in the neutral band 3, thus separating the area of virtual positrons from the area of virtual electrons.

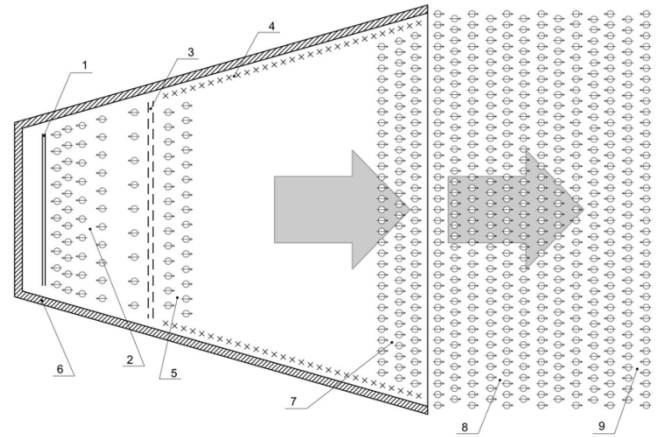


Fig.2.

Critics are quick to point out that the drive violates one of the fundamental laws of physics, namely: for every action, there is an equal and opposite reaction. It is necessary to pay attention to zone 4 - the zone of virtual electrons arising at a small distance from the inner surface of this truncated cone due to the repulsion of virtual electrons by real electrons (Roger Penrose, 2004). These virtual electrons will tend towards the base of the cone. The neutral zone 3 is followed by the zone 5 of the minimum density of virtual electrons, the density of which increases as it approaches the bottom of the truncated cone. Copper truncated cone 6 - engine housing. Zone 7 with the maximum density of virtual electrons of the engine, attracted by virtual electrons of the environment and creating the main thrust for the engine through interaction with the environment. Zone 8 is a zone of active interaction of virtual electrons of the engine and virtual electrons of the Physical Vacuum, as a result of which an effort is created that moves this device in the chosen direction. This is followed by zone 9 - the zone of virtual positrons, which are constantly repelled by virtual electrons, creating a zone of virtual electrons in the direction of motion, thus supporting the movement in the space of the Shawyer engine. Thus, during the movement of the engine, the Physical Vacuum will be constantly polarized in the form of virtual electrons in the vicinity of the the base of engine, then passes into the zone of virtual positrons, which ensures the movement of the device.

Here are some examples of the interaction of torsion fields: Interaction of torsion fields of tops A clockwise spinning top creates a right field when viewed from above, that is, it polarizes the PV around it. Another top rotating clockwise, falling into the field of the first top, will be attracted by it, since such fields are attracted. Thus, tops rotating in the same direction will attract, and tops rotating in opposite directions will repel and move away from each other. It is believed that

the behavior of spinning tops is purposeful, and when the spinning tops interact, they exchange information. They need to correct ideas about space and time, and in this sense one can talk about a certain system. Undoubtedly, the unity of the world is an informational in nature. It is believed that quantum particles are objects in much the same way as classical ones. This similarity provides an important continuity between classical and quantum physics. A.K. Tam and W. Happer (16) observed the attraction of circularly polarized laser beams if their radiation was directed in one direction. If the laser beams were directed oppositely, then these beams were repelled. These experiments are logical among those considered, if we take into account the interaction of torsion fields produced by the radiation of interacting lasers. The theory of torsion fields made it possible to explain the fact of attraction and repulsion of laser beams in the experiments of A.K. Tam and V. Happer.

Casimir effect: Let us consider in more detail the Casimir effect, which will help shed light on the principle of Shawyer engine. According to Wikipedia - "Casimir Effect" - the effect is consisting in the mutual attraction of conductive uncharged bodies under the action of quantum fluctuations in a vacuum. Most often, we are talking about two parallel uncharged mirror surfaces located at a close distance, but the Casimir effect also exists for more complex geometries. It is believed that the cause of the Casimir effect is the energy vibrations of the physical vacuum due to the constant creation and disappearance of virtual particles in it. Hence, the effect is confirmed experimentally. It is known that the physical vacuum is not an absolute void. It constantly creates and disappears pairs of virtual particles and antiparticles - there are constant fluctuations. A virtual photon, after passing a certain distance, becomes a virtual electron-positron pair. The electron and the positron are made half a turn in opposite directions, drawing a circle in space. At the junction they disappear and generate a virtual photon, which moves further (Pavlenko, 2018). Thus, virtual particles and antiparticles are constantly in the physical vacuum. In addition, around any manifested object there is a halo of virtual electrons that are repelled by the real electrons of the objects mentioned. In the space between closely located mirror surfaces, there is interaction of virtual electrons (like attracts like). The closer to each other the surfaces, the greater the force of attraction between them. Given the above, it seems reasonable to assume that the Shawyer engine uses the phenomenon of mutual attraction of virtual electrons in the bottom of the conduction truncated cone, as an integral part of the engine, and the virtual electrons of the Physical Vacuum, which always exist under the action of quantum fluctuations in the Physical Vacuum. Casimir interactions play an important role in the dynamics of nanoscale objects. The contactless transfer of angular momentum at the nanoscale was investigated by analyzing the Casimir torque acting on a chain of rotating nanoparticles. It has been shown that this interaction provides an efficient transfer of angular momentum between circuit elements. These results are essential for the control and manipulation of nano mechanical devices.

Torsion fields and the consciousness of elementary particles: Torsion field have a number of unique properties. They transfer the information without transferring energy, they spread practically instantly to any distance, and they are not shielded by known environments, except for orthogonal structures. Besides, they have one more surprising property- they promote self-organization of substance ,

including living matter. And this is all due to the fact that they have their own consciousness. Openheimer wrote: "We do not understand the nature of matter, the laws that govern it, and the language in which it should be described." Many people can doubt about this approach, but to the sub-consciousness of real particles Nikola Tesla had already pointed out in his time. For nearly a century, the physical community has denied such a thought, *let alone* attempted to show it. Tesla was convinced that everything in the Universe, down to the electron (at that time there was not a conception about virtual particles) possessed the consciousness. The universe is a whole organism, which consists of many parts, but differing in the frequencies of vibrations. Space is a single intelligent living organism. Tesla treated electricity as a living creature. He could talk to him and give him his orders. Each elementary particle - electron, positron, proton and other - is a complex organized entity. It is a living intelligent being, in its spiritual level, it's no easier than you and me, and it's not unusual to agree with them and get in touch with them. Elementary particles, as mentioned earlier, are conscious. Particle behavior is purposeful, particles exchange information during interaction. They must have a correlated view of space and time. We can say that the civilization of particles has come a long way in its development. Two or more particles can use a common strategy while being entangled. Confused, they nevertheless always act in concert. How to test the proposed hypothesis? Here we can give examples that support the hypothesis. Let us consider in more detail the presence of consciousness in elementary virtual particles - virtual electrons and positrons that fill the Physical vacuum and are carriers of the torsion field (1,6, 17,18,19). The first is to determine, for example, in an apartment the left and right torsion nodes of the Earth's geopathic zones. It is known that these sites contain virtual electrons and positrons. By connecting the left and right nodes of the geopathic zones with a wire or a simple rope, we establish the state of harmonisation of the space in this room.

This means that packets of ring waves from an electron and a positron are embedded in each other, and a true harmonisation of such an electron-positron vacuum occurs, while there will be no effect of the geopathic zones on human health. The second possibility consists in influencing the particles of these geopathic zones nodes with information. If you place a photograph of it on any of the geopathic zones, then the state of harmonisation will also be established in the room, i.e. there will be no impact of the geopathic zones on human health. Many believe that if it creates any thrust that does not have equal response in the opposite direction, then it definitely violates what we know about physics. The fact that it can create more thrust in one direction than the opposite means that we are definitely missing something in physics. However, everything is correct. Indeed, this is due to the shape of the device in the form of a truncated cone. Most of it is where there is the largest part of virtual electrons collected in this place in accordance with the laws of interaction of virtual particles - like attracts like. As you move away from the bottom of the cone towards its top, virtual particles become less and less, and in zone 3 they are completely absent. Zone 2 is the zone of virtual positrons, and it practically has no effect on the movement of the apparatus. The apparatus moves due to the interaction of virtual particles located near the bottom of the cone with virtual particles of the Physical Vacuum, which are located in nearby space. As the engine progresses, the virtual positron zone of the Physical Vacuum is removed due to repulsion by the engine's virtual electrons, and the motion

continues as needed. The article (20) described the dynamic operation of the second generation EmDrive superconducting engines. Three engine designs are evaluated. One is used as the lift engine for the launch vehicle, the other as the orbital engine for the launch vehicle, and the third as the main engine for the interstellar probe. Each of these engines can be improved by adding additional sources of virtual electrons to its design, which will provide an increase in engine thrust. Obviously, the properties of Shawyer's engines are determined by both the structure and the substance used for the hull, and so-called Synchronization. It is an universal physical phenomenon, first recognized in 1665 by Christiaan Huygens. Synchronization phenomena are abundant in science, nature, engineering and social life. These phenomena is universal and can not be understood within a common framework based on modern nonlinear dynamics.

At the initial moment, many of these virtual electrons are in a state of spin imbalance, because each of them has a different direction of spin orientation and, as it were, its own source of energy, which ensures its continuous rotation. Inconsistent directions of spin orientation create a complex dynamical system inaccessible to statistical mechanics. But in a short time, synchronization of oscillations is carried out, at which the steady-state oscillation frequency of virtual electrogens differs little from the natural oscillation frequencies of each of them, and this ensures their close mutual influence with each other. The generalization of disparate experimental data led to the understanding that synchronization is a very universal fundamental physical phenomenon, consisting in the adjustment of the rhythms of oscillating objects due to the torsional interaction between them. Following the synchronization inside the engine, synchronization of the nearby part of the Physical Vacuum is carried out, which ensures stable interaction of the engine with it.

DISCUSSION

Shawyer background was with UK Army research and then in the space industry. The keys to EMDrive experiments are prove the propulsion is real and will work in space. We have provided a new way of explaining the operation of the Shawyer engine and we can increase the efficiency of this engine, using our approach to the problem. The article describes the phenomena that cannot be explained from the point of view of orthodox physics. It is assumed that the "fundamental" physical theory to be developed should be able to include the intelligent consciousness of elementary particles. This theory will allow us to reach a deeper level of description of physical phenomena. Prominent British physicist, Nobel Prize laureate Roger Penrose points out that this new, as yet absent theory, must be "uncomputable", that is, so that its action cannot be modelled by a Turing machine. The practical results described in the article may advance theoretical ideas for the creation of a new improved spacecraft for interplanetary flights. This theory will be based on internal simplicity and on the interaction of elementary particles.

The drive is based on the interaction of virtual electrons inside the asymmetric cavity with the Physical Vacuum, and the thrust is created by these very virtual electrons located in the immediate vicinity of the bottom of the said asymmetric cavity. At the opposite end of the cavity there are virtual positrons in a very small amount, which have practically no effect on the

process of interaction of virtual electrons with the Physical Vacuum. This seems impossible according to Newtonian physics, which says that a closed system cannot create pure thrust. But in the surrounding space, saturated with all kinds of virtual particles, other laws operate that allow such a movement to be carried out. Now is a good time to rethink many foundational problems in torsion field technologies. Using technological concepts derived both from traditional science and from what is considered the new torsion paradigm of science, it is possible to create real vehicles for interplanetary communications.

Conclusion

Therefore, it can be argued that the Shawyer's engine potentially demonstrates the interaction of virtual electrons that constantly exist in the area of the bottom of a truncated cone with a quantum vacuum virtual plasma, or in other words, with the Physical Vacuum. Summing up, I would like to once again draw your attention to the fact that work on torsion technologies is not limited to those areas that were discussed here. In fact, as it becomes clear, progressive development includes all sectors of the economy, industry, agriculture and medicine, as well as all everyday problems. The technologies we mentioned are harbingers of the fact that humanity is on the threshold of the age of torsion technologies. The study of torsion fields will help to establish connections between a number of areas and phenomena that for many years seemed to have nothing to say to each other.

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