Załącznik nr 3 (EN).

SUMMARY OF PERSONAL ACCOMPLISHEMENTS

ABOUT THE POSSESSIONS AND ACHIEVEMENTS
IN SCIENTIFIC AND RESEARCH WORK

Roman Szostek

Rzeszów, 2019-04-29

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1. Name and surname:

Roman Szostek

2. Education and degrees:

2002-12-19 PhD degree in technical sciences in the field of automation and robotics.
Doctoral dissertation entitled: **Analysis of the non-Markov processes and their approximation with selected Markov processes**.
Dissertation defended at the Faculty of Electrical Engineering, Automatics, Computer Science and Electronics at AGH University of Science and Technology.
Promoter: prof. dr hab. inż. Bogusław Filipowicz.
Reviewers: prof. dr hab. inż. Jerzy Klamka (Silesian University of Technology),
prof. dr hab. inż. Adam Władysław Kowalewski (AGH University of Science and Technology).

1995-06-26 Master's degree engineer in the field of Electronics in terms of Automation obtained at the Faculty of Electrical Engineering, Automatics, Computer Science and Electronics of the AGH University of Science and Technology.

3. Information on previous employment in scientific units:

From 2003-10 Adjunct – Rzeszów University of Technology; Department of Quantitative Methods.

From 2001-10 to 2003-06 Assistant – University of Information Technology and Management in Rzeszow; Administrative and IT Department; Department of Computer Science.

4. Scientific achievement, according to art. 16 sec. 2 of the bill from 14 March 2003 r. on scientific degrees and title and degrees and title in the domain of arts (J. Laws No.65, item 595 with modif.):

4.1. Title of the achievement

My scientific achievement, obtained after receiving the degree of doctor of technical sciences, constituting a significant contribution to the development of the scientific discipline of physics, defined in art. 16 sec. 2 of the binding act, is a monothematic series of publications on **relativistic mechanics with a universal reference system**.

Focused on one subject, series of publications that make up the indicated scientific achievement presents a formal derivation of the new physical theory called the Special Theory of Ether. This theory is a different model of relativistic mechanics than the one presented in the Special Theory of Relativity. The Special Theory of Ether is a relativistic mechanics with a universal reference system in which light propagates. The presented series of publications concerns **relativistic mechanics with a universal reference system** and presents a multi-aspect approach to this issue.

The publication cycle presents three original methods of deriving relativistic kinematics with a universal reference system that are consistent with experiments in which the speed of light was measured and the author's method of deriving numerous dynamics for each relativistic kinematics was presented.

In the presented cycle of publications, it has been shown that the Michelson-Morley and Kennedy-Thorndike experiments can be explained by kinematics with a universal reference system in which light propagates. It is not true, then, that these experiments proved that such a universal reference system does not exist. It has been demonstrated that such kinematics is infinitely many and the formal derivation of these kinematics has been presented. Basic kinematic properties with a universal reference system have been derived, such as:

- length contraction (Lorentz–FitzGerald),
- time dilation,
- speed transformation,
- formulas for the one-way speed of light in the inertial reference system,
- Doppler effect,
- formula for the speed of the inertial system in which the dipole microwave anisotropy of the background radiation was measured, relative to the universal reference system.

It has been shown that mathematics, on which the kinematics of the Special Theory of Relativity is based, can be interpreted differently and leads to other conclusions about the properties of this kinematics, i.e. kinematics with a universal reference system. It has been shown that there are infinitely many kinematics in which the one-way speed of light is absolutely constant. Kinematics of the Special Theory of Relativity is just one of those infinitely many kinematics. In all other kinematics of this type, the universal reference system appears explicitly.

The assumptions underlying the dynamics of the Special Theory of Relativity were tidy. Thanks to this, it was possible to create an innovative method of deriving relativistic dynamics for both the Special Relativity and the Special Theory of Ether. In this way it was shown that for any relativistic kinematics one can deduce mathematically an infinite number of dynamics in a correct mathematical manner.

The above issues are presented in a series of ten scientific publications presented in section 4.2.

4.2. List of works constituting a scientific achievement

1. Szostek Roman, Szostek Karol, *The Geometric Derivation of the Transformation of Time and Position Coordinates in STE*, IOSR Journal of Applied Physics (IOSR-JAP), Volume 8, Issue 4, Version III, 2016, 22-30, ISSN 2278-4861 (**5 points MNiSW**).
   http://www.iosrjournals.org/iosr-jap/pages/v8(4)Version-3.html
   My percentage contribution **50%**.

2. Szostek Roman, Szostek Karol, *The explanation of the Michelson-Morley experiment results by means universal frame of reference*, Journal of Modern Physics, Volume 8, No. 11, 2017, 1868-1883, ISSN 2153-1196 (**5 points MNiSW**).
   https://doi.org/10.4236/jmp.2017.811110
   My percentage contribution **50%**.

3. Szostek Roman, *Uogólnienie Transformacji Galileusza* (in Polish: Generalization of Galilean Transformation), Problems of Applied Sciences, Szczecin, Poland, Tom 7, 2017, 115-132, ISSN 2300-6110 (**list B -4 points MNiSW**).
   http://pns.edu.pl/index.php/pl/wydane-numery/tom-7/nauki-podstawowe-i-techniczne/uogolnienie-transformacji-galileusza
   My percentage contribution **100%**.

4. Szostek Roman, Szostek Karol, *Jednokierunkowa prędkość światła i efekt Dopplera w Szczególnej Teorii Eteru* (in Polish: *One-way speed of light and Doppler effect in Special Theory of Ether*), Scientific notebooks of the Uczelnia Warszawska im. Marii Skłodowskiej-Curie, Poland, 4 (58), 2017, 141-160, ISSN 1897-2500 (**list B -7 points MNiSW**).
   http://www.uczelniawarszawska.pl/pdf/IV_2017.pdf
   My percentage contribution **50%**.

5. Szostek Roman, Szostek Karol, *Kinematics in Special Theory of Ether*, Moscow University Physics Bulletin, Vol. 73, № 4, 2018,413-421, ISSN: 0027-1349 **(Web of Science, list A -15 points MNiSW)**.
   https://link.springer.com/article/10.3103/S0027134918040136
   My percentage contribution **50%**.

6. Szostek Karol, Szostek Roman, *The derivation of the general form of kinematics with the universal reference system*, Results in Physics, Volume 8, 2018, 429-437, ISSN: 2211-3797 **(Web of Science, list A -25 points MNiSW)**.
https://doi.org/10.1016/j.rinp.2017.12.053
My percentage contribution **50%**.

7 Szostek Karol, Szostek Roman, *Mechaniczny układ pomiaru prędkości światła przepływającego w jednym kierunku* (in Polish: *A mechanical measuring the speed of light that extends in one direction*), Technical Review, Warszawa, Poland, 8-9/2018, 28-31, ISSN 0137-8783 (**list B -4 pkt. MNiSW**).
http://www.sigma-not.pl/publikacja-113286-.html
My percentage contribution **50%**.

8 Szostek Roman, *Dynamiki w Szczególnej Teorii Eteru* (in Polish: *Dynamics In The Special Theory Of Ether*), Problems of Applied Sciences, Szczecin, Tom 8, 2018, 119-134, ISSN 2300-6110 (**list B -4 points MNiSW**).
http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.baztech-0b8c8fb7-20b3-4dd7-aeb0-38c89f991c70?q=bwmeta1.element.baztech-0657f785-daba-4919-b5f3-1ccc4aa3499d;8&qt=CHILDREN-STATELESS
My percentage contribution **100%**.

9. Szostek Roman, *Wyprowadzenie wszystkich transformacji liniowych spełniających wyniki eksperymentu Michelsona-Morleya oraz dyskusja o podstawach relatywistyki* (in Polish: *Derivation of all linear transformations that meet the results of Michelson-Morley's experiment and discussion of the relativity basics*), Problems of Applied Sciences, Szczecin, Tom 9, 2018, 001-026, ISSN 2300-6110 (**list B - 4 points MNiSW**).
http://yadda.icm.edu.pl/yadda/element/bwmeta1.element.baztech-816510e1-c476-4def-92a3-67f8a16e1be6?q=bwmeta1.element.baztech-fb0abf51-06ab-4a2f-8396-d55d81b8872b;0&qt=CHILDREN-STATELESS
My percentage contribution **100%**.

10. Szostek Roman, *Derivation method of numerous dynamics in the Special Theory of Relativity*, Open Physics (the earlier name of the journal is: Central European Journal of Physics), Vol. 17 (1), 2019, 153-166, ISSN: 2391-5471 **(Web of Science, list A - 25 points MNiSW)**.
https://doi.org/10.1515/phys-2019-0016
My percentage contribution **100%**.

4.3. Description of the scientific objectives and the research results presented in publications, together with the discussion of their possible applications

4.3.1. Description of the scientific objectives

At the basis of the Special Theory of Ether is the observation that the one-way speed of light has never been measured exactly. In accurate experiments, only the average speed of light on a path with closed trajectory was measured. This was also the case of the Michelson-Morley and Kennedy-Thorndike experiments, in which streams of light move along the road

to the mirror and back. From these experiments it is at most clear that the average velocity of light moving in a vacuum on a path with a closed path is constant. It does not follow from them that the one-way speed of light in a vacuum is constant.

The problem of accurately measuring the one-way speed of light is technically unresolved because the atomic clocks are out of sync if they move relative to each other. To measure the one-way speed of light it would be necessary to synchronize the two atomic clocks, which are next to each other, and then one of them should be moved to a remote place, to which a stream of light will be sent. Unfortunately, during the movement, the atomic clock is out of sync with the clock left in place in the range important enough to affect the measurement of the one-way speed of light. In this way it is not possible to precisely measure the one-way speed of light, because it is not known how much the result of the measurement will depend on the speed of light, and how much will depend on the synchronization of the clocks.

The scientific goal of research on relativistic mechanics in which is universal reference system was to explain the results of Michelson-Morley and Kennedy-Thorndike experiments, and all other experiments in which the average speed of light was measured using the theory with a universal reference system. As a consequence, a new physical theory was created called the Special Theory of Ether (STE), which is a model of kinematics and relativistic dynamics (relativistic mechanics). This theory is consistent with the results of all known experiments, although its predictions differ from the predictions of the Special Theory of Relativity (STR). This has been discussed in [5]. Differences between STR and STE occur when the observer moves towards the ether in STE. According to the calculation presented in publication [6], the speed with which the Solar System moves relative to the universal reference system is 369.3 km/s = 0.0012 c. For such a low speed the effects of non-isotropy of space predicted by STE are very slight. Therefore, STR and STE predictions for experiments performed in the Earth system are almost identical. This results in the results of known experiments being consistent with both STR and STE. The falsification of STE requires specially designed experiments and their implementation with a sufficiently high accuracy.

4.3.2. Presentation of the research results achieved

The disclosure of the results of research on the Special Theory of Ether began with the publication in 2015 of a scientific monograph entitled 'Special Theory of Ether'. Then, the monothematic ten publication cycle presented in section 4.2 was published.

The publication [1] presents the derivation of the transformation, on which the **Special Theory of Ether without transverse contraction**. The derivation is based on a geometric analysis of the flow of light in Michelson-Morley and Kennedy-Thorndike experiments. The presented derivation is simplified due to the fact that it was based on one additional assumption. It was intended to derive a transformation with a universal reference system that explains the analyzed experiments, but in the approximate way to the known derivation by the geometric method of Lorentz transformation. The publication also derives a relationship between relative velocities and a formula for the one-way speed of light, measured in an inertial reference system, moving in parallel to the speed with which the inertial system moves.

Derivation of the transformation was presented in the publication [2], on which the **Special Theory of Ether without transverse contraction** is based. The presented derivation also relies on a geometric analysis of the light flow in Michelson-Morley and Kennedy-Thorndike experiments, but it is based on fewer assumptions. For this reason, a full analysis of the flow of two light streams was necessary in this case. In the publication, the minimal

assumptions were formulated for the **Special Theory of Ether without transverse contraction** in the following form:

I. There is a universal frame of reference (UFR) with respect to which the velocity of light in vacuum is the same in every direction.
II. The average velocity of light on its way to and back is for every observer independent of the direction of light propagation. This results from the Michelson-Morley experiment.
III. The average velocity of light on its way to and back does not depend on the velocity of the observer in relation to the UFR. This results from the Kennedy-Thorndike experiment.
IV. In the direction perpendicular to the direction of the velocity of the body, moving in relation to the UFR, there is no contraction or elongation of its length.
V. The transformation «UFR - inertial system» is linear.

In the publication [2] the formula for relative velocity was also derived and the dipolar anisotropy of microwave background radiation was explained using the Special Theory of Ether. The approximate formula for the speed of the inertial system, in which the dipolar anisotropy of the microwave background radiation was measured relative to the universal reference system, was derived by the simplified method.

Another way of derivation of transformation (called the analytical method), on which the **Special Theory of Ether without transverse contraction** is based, has been presented in the publication [3]. The developed method allows the derivation of a very general form of transformation with a universal reference system. This transformation can meet the results of Michelson-Morley and Kennedy-Thorndike experiments only in inertial systems moving at low speed relative to the universal reference system.

Thanks to such transformations, it is possible to build relativistic mechanics taking into account the fact that all experiments conducted by man were observed with inertial frames of reference moving with small velocities relative to the Solar System. Such experiments do not provide an answer on how the laws of nature look like for observers found in the inertial frames of reference moving with large velocities relative to the Solar System. Therefore, in physical theories, the results obtained in frames of reference available to the observer are extrapolated to all other inertial frames of reference. For this reason, they are acceptable as valid models of real processes, kinematics based on transformations that do not meet the results of Michelson-Morley and Kennedy-Thorndike experiments in all inertial frames of reference, but only in frames of reference available for experiments. The introduction of such transformations is presented in the article [3].

Innovative methods of derivation of transformation and introduction of a universal reference system to them have been presented in publication [3]. How to specify such transformations to the form in which they meet the results of Michelson-Morley and Kennedy-Thorndike experiments, has been shown. Finally, the formula for summing velocities for absolute velocities and for relative velocities has been derived.

Three formulas for the one-way speed of light flowing in a vacuum in any direction for the for the **Special Theory of Ether without transverse contraction** have been deduced in the publication [4]. It has been shown that although in the inertial reference system the one-way speed of light in a vacuum depends on the direction of propagation and the speed with which the inertial system moves relative to the universal reference system, the average speed of light in a vacuum is always constant. For this reason, the rotation of the interferometer arms in the Michelson-Morley and Kennedy-Thorndike experiments does not affect the interference fringes. That is why these experiments could not detect the universal reference system in which light propagates, even if such a universal system exists.

Then, formulas for the Doppler effect for the frequency of light moving in a vacuum were derived in the publication [4]. The general formula is formed by two formulas. One of them describes the Doppler effect from the inertial system to the universal reference system. The second one describes the Doppler effect from the universal reference system to the inertial system.

The basic properties of the Special Theory of Ether without transverse contraction were derived in the publication [5]. The velocity transformation, the formula for longitudinal length contraction (Lorentz-FitzGerald) and the formula for time dilation have been derived. From the time dilation formula, it follows that in the **Special Theory of Ether without transverse contraction** the simultaneity of events is absolute. Finally, the discussion about the differences between STR and STE was carried out. The main difference is that according to STR the space for the observer from each inertial system is isotropic. According to STE, the space is isotropic only to the observer from the universal reference system. This difference between theories makes it possible to falsify STE in the future. The difficulty of such falsification lies in the fact that according to the STE for observers moving in relation to the universal reference system, the space ceases to be isotropic, but this non-isotropy is very slight if they move at relatively low speeds (non-relativistic velocities). Therefore, measuring the non-isotropy of space resulting from STE is a technically difficult task due to the low speed of the solar system relative to the universal reference system.

An important theoretical conclusion resulting from research on the **Special Theory of Ether without transverse contraction** as presented in [5] is that acceptance of the fact that the speed of light can depend on the direction of its emission does not distinguish any direction in space. We are concerned with the light speed measured by a moving observer. The speed with which the observer moves relative to the universal frame of reference distinguishes a characteristic direction in space, but only for this observer. For an observer who is immobile relative to the universal frame of reference, the speed of light is always constant and does not depend on the direction of its emission. If the observer moves relative to the universal frame of reference, space is not symmetric for him. This case is similar to the case of an observer who is sailing through water and measures the wave speed on the water. In spite of the fact that the wave propagates over the water with a constant speed in each direction, the speed of the wave will be different in different directions for a sailing observer.

In publication [6], it has been shown that there are infinitely many kinematics with a universal reference system that are consistent with the results of Michelson-Morley and Kennedy-Thorndike experiments. These kinematics have been called **Special Theories of Ether with transverse contraction**. The transformations on which these kinematics are based have been derived by the geometric method thanks to the weakening of the assumption IV, on which the **Special Theory of Ether without transverse contraction** is based. In this way, changes in the transverse dimensions of bodies moving relative to the universal reference system have been allowed. On the basis derivation of transformations many kinematics of bodies can be built, describing different physical properties, such as time dilation. The parameter $\psi(v)$ describing transverse contraction occurs in the transformations describing these kinematics. In the publication [6], but also in the publication [9], it has been shown that parameter $\psi(v)$ is not a variation of scale. Any change to this parameter changes the physical properties of kinematics. It is sufficient to note that this parameter determines the time dilation. That is, the way in which time is measured by clocks moving in relation to the universal frame of reference depends on the value of parameter $\psi(v)$.

The publication [6] shows that kinematics (in which time is absolute) consistent with the results of Michelson-Morley and Kennedy-Thorndike experiments is possible and that kinematics in which there is no longitudinal contraction (Lorentz-FitzGerald) is possible. The

speed transformation for all **Special Ether Theories with transverse contraction** was derived. It has also been demonstrated that in each of these kinematics the same formulas apply to the one-way speed of light in a vacuum. It follows that measuring the one-way speed of light cannot be the basis for deciding which of the **Special Theory of Ether with transverse contraction** is the best model of real processes. Such a decision should be based on other measurements, e.g. on the measurement of time dilation.

The exact formula for the speed of the inertial system, in which the dipole anisotropy of the microwave background radiation was measured relative to the universal reference system, was derived in the publication [6]. This formula was derived assuming that for a fixed observer relative to the universal reference system the space is isotropic. So the microwave background radiation is homogeneous for such an observer. With this assumption, on the basis of the already known Doppler effect for **the Special Theory of Ether without transverse contraction**, the speed at which the solar system moves relative to the universal reference system can be calculated. This speed is 369,3 km/s = 0,0012 *c*. However, for other kinematics of **Special Theories of Ether with transverse contraction**, there is a different formula for time dilation. Therefore, according to these kinematics, the speed of the solar system relative to the universal reference system is different.

The proposal of a mechanical device for testing the one-way speed of light is presented in the publication [7]. The presented concept comes from the patent number P.414434 of the same authors, obtained at the Polish Patent Office. The device concept is based on a rotating wheel. The measuring device proposed in this publication is not intended to precisely measure the one-way speed of light, only to measure the speed of light in one direction accurate enough to check whether the one-way speed of light in a vacuum depends on the direction of its emission in our reference system. In this publication, the minimum requirements for a measuring device were estimated, where the non-uniformity effect of the one-way speed of light predicted by the STE should be measurable based on the formula for the one-way speed of light derived from the Special Theory of Ether with transverse contraction.

Three example dynamics for **the Special Theory of Ether without transverse contraction** have been derived in the publication [8]. For this purpose, the method previously developed for the purposes of the Special Theory of Relativity has been used and published in [10] (publication [10] was later published due to the publishing process). In the publication [8], it was shown that within each kinematics of the Special Theory of Ether, infinitely many dynamics can be derived. The derivation of dynamics is based on four formulas in force in STE kinematics. In order to derive the STE dynamics, it is necessary to assume an additional assumption for kinematics, which allows introduced concepts to the theory: inertial mass, kinetic energy and momentum. This additional assumption can be formulated in various ways, which is why it is possible to derive different dynamics for the STE. The decision which of all possible dynamics of the Special Theory of Ether is the best model of real processes must result from experiments. The calorimeter can be useful for this purpose. This device makes it possible to measure the amount of heat released when particles accelerated at high speed are stopped. On this basis, graphs of the kinetic energy of the accelerated particles as a function of their velocity can be determined. On the basis of a precisely made such an experiment, it will be possible to indicate the dynamics in which the kinetic energy of the particles is consistent with the experiments.

The article shows that the Special Theory of Ether, which is a theory describing inertial systems, is very well suited for describing also systems accelerated in relation to the universal reference system.

All linear transformations consistent with the results of Michelson-Morley and Kennedy-Thorndike experiments (without rotation) were derived in the publication [9]. The class of transformations derived in the study is a generalization of transformations derived in the paper [6], which consists in enabling non-zero values of parameter $e(v)$.

In the publication [9] have been shown that there are infinitely many kinematics in which the one-way speed of light is absolutely constant. Kinematics of the Special Theory of Relativity is just one of those infinitely many kinematics. In all other kinematics of this type, the universal reference system appears explicitly. It presents that mathematics on which STR kinematics is based can be interpreted differently and this leads to other conclusions on the properties of this kinematics. After adopting a different interpretation of this mathematics in the Special Theory of Relativity, the universal reference system reveals itself and this theory is transformed into a Special Theory of Ether without transverse contraction.

In the publication [10], the author's method was developed, which enables to derive infinitely many dynamics in relativistic mechanics, on the example of the Special Theory of Relativity. In the publication, the assumptions needed to derive dynamics have been ordered. Derivation of dynamics in relativistic mechanics is based on kinematics and an additional assumption that allows introduced concepts to the theory: inertial mass, kinetic energy and momentum. In the case of the Special Theory of Relativity, two formulas are needed from kinematics, one is a transformation for the differential from speed, the other is a formula for time dilation. In the publication [10] have shown five examples of these derivations. In this way, It is presented that the dynamics known today as the dynamics of Special Theory of Relativity is only one of infinitely of theoretically possible.

The method developed in the publication [10] consists in the analysis of accelerated systems by bringing them closer to an infinite sequence of inertial systems.

Thanks to the method developed in the publication [10], it was possible to derive the dynamics for **the Special Theory of Ether without transverse contraction**. This derivation was presented in the publication [8].

* * *

The result of the research, which was achieved in the cycle of publications [1-10], which make up the indicated scientific achievements, is the development of the foundations of a new physical theory of relativistic kinematics and dynamics. In these publications, the mathematical methods of theoretical physics of derivation and analysis of relativistic mechanics with the universal reference system have been developed.

The validity of the results obtained is evidenced by the fact that in modern physics there is a common belief that two conclusions result from the Michelson-Morley and Kennedy-Thorndike experiments:

1. There is no universal reference system in which light propagates (consequently all inertial systems are equivalent, that is, they are indistinguishable experimentally),
2. The one-way speed of light in the vacuum is absolutely constant, i.e. it has the same value in each direction of propagation and for each observer.

In the series of publications that make up the indicated scientific achievements, it has been shown that the above conclusions are incorrect. Conclusion 1 was drawn because it was not possible to explain the Michelson-Morley and Kennedy-Thorndike experiments using the theory of ether. The works on the Special Theory of Ether prove that there are infinitely many such theories. Conclusion 2 was drawn because it was hastily assumed that the average speed of light on the way back and forth is the same as the one-way speed of light. The experiments carried out show, at most, that the constant is the average, not the one-way speed of light in a vacuum.

Another unwarranted belief in modern physics is the belief that it is possible to construct only one dynamics within relativistic mechanics. This dynamics is commonly known as the dynamics of the Special Theory of Relativity. In the series of publications that make up the indicated scientific achievements, it has been shown that both under the Special Theory of Relativity and the Special Theory of Ether it is possible to derive infinitely many dynamics that are formally correct. Of course, this does not contradict the fact that currently recognized dynamics of the Special Theory of Relativity is presented as compatible with all known experiments.

Experimental evidence of the existence of a universal frame of reference is known, which proves the rationality of the presented research. It is the measurement of anisotropy of cosmic microwave background. Electromagnetic cosmic microwave in a range of 300 GHz reaches from all cosmic sides. Cosmic microwave in our frame of reference has dipole anisotropy. Cosmic microwave reaching from the side of Lion constellation has a little more energy, while the one reaching from the side of Aquarius constellation has a little less energy. If Doppler effect is taken into account, it is possible to determine the frame of reference, in which cosmic microwave background is homogeneous. Such a frame of reference is unique in relation to all others. Thus inertial systems are experimentally distinguishable. The Special Theory of Ether, derived in the presented cycle of publications, allows to explain the dipole anisotropy of microwave background radiation within the framework of mechanics without referring to the theory of the Big Bang.

4.3.3. Presentation of the possible use of the results achieved

The results of research work, presented in publications [1-10], can be used practically or be the basis for further research.

I see the perspectives for further development of the taken up issues in:

- Research on adaptation of relativity with a universal reference system for the needs of Quantum Mechanics.
- Research on the adaptation of relativity with the universal reference system for the purposes of the General Theory of Gravity.
- Constructing experiments that falsify the Special Theory of Ether. In particular, research on the possibility of performing experiments in the Large Hadron Collider, which could reveal the effects of space heterogeneity from the perspective of our reference system.
- Derivation of dynamics of bodies for all spatial dimensions within the Special Theory of Ether.
- Performing the simulation of the operation of satellite navigation systems based on the models of the Special Theory of Ether and their confrontation with real data from these systems.

At the present stage of development of the Special Theory of Ether, the following applications of the results envisaged by this theory seem real:

- The use of space anisotropy in navigation. According to the Special Theory of Ether, the space is slightly non-isotropic from the perspective of our frame of reference. Measurements of dipole anisotropy microwave background radiation confirm this. However, in order to be able to use non-isotropy of space in practice for navigation, searching for other phenomena confirming this prediction and developing measurement methods are necessary. In perspective, determining the absolute direction in space in our reference system will create the possibility of using such technologies in air transport and in space exploration, and perhaps also in the mining industry.

- Optimization of satellite navigation systems. Modeling the time dilation phenomenon using the Special Theory of Ether can contribute to the optimization of satellite navigation systems, such as GPS. If there really is a universal frame of reference in which light propagates, then the inclusion of this fact in satellite navigation systems models can improve the operation of these systems.
- The models of dynamics of bodies within the Special Theory of Ether can contribute to the optimization of the transport of heavy bodies to Earth's orbit and the progress in research on elementary particles carried out in such centers as Large Hadron Collider.

5. Discussion of other scientific and research achievements

A detailed list of scientific, research, didactic and organizational achievements is provided in Appendix 5.

5.1. Didactic and scientific activities before obtaining the doctoral degree

After completing my Master's degree, I took up doctoral studies at the Faculty of Electrical Engineering, Automatics, Computer Science and Electronics at the AGH University of Science and Technology in Krakow. During my doctoral studies I conducted didactic classes in computer science.

Before the defense of my doctoral dissertation, my scientific achievements consisted of five scientific publications and concerned the applications of probabilistics.

5.2. Scientific and research activity after obtaining the degree of doctor of technical sciences

After defending my doctoral thesis in my scientific activity I dealt with widely understood applications of mathematics. My publications concern probabilistic applications, an innovative system of organization of sports competitions, statistics, forecasting methods, modeling of geothermal energy recovery systems and economics.

I am the author of an innovative system of sports competitions. My original contribution is to look at the problem of organizing sports competitions as an algorithmic issue, which can be treated as a generalized problem of sorting (*Probabilistic Sorting*). On this subject I wrote two publications and one post-conference material, in which I formulated a generalized sorting problem, I proposed an algorithm for solving it and presented the application of this algorithm to the organization of sports competitions.

During my scientific work I took an active part in numerous scientific conferences.

I currently deal with theoretical physics. I am the co-author of the new physical theory, which has been called the Special Theory of Ether. Works on it form a series of publications that make up my scientific achievement indicated in this document.

5.3. Didactic activity after obtaining the degree of doctor of technical sciences

For several years of my didactic work I taught classes in the following subjects:
- algorithm theory,
- Numerical Methods,
- operational research,
- optimization,
- mathematical statistics,

- forecasting methods,
- programming languages,
- econometrics.

Over a dozen years of didactic work, I was a supervisor of many engineering, undergraduate and master's theses.

For several years I organized at the Rzeszów University of Technology the Student Scientific Society of Alternative Economics, where I dealt with alternative economic theories. The four participants of this circle were the authors of their own publications, which they presented at national conferences.

Rzeszów, 30 April 2018. ……