Robert Nazaryan and Hayk Nazaryan

Foundations Armenian Special Theory of Time - Space in One Physical Dimension With Pictures (Kinematics)

Yerevan - 2019

100 Years Inquisition In Science Is Now Over.
And Armenian Revolution In Science Has Begun!
2007

Foundations of Armenian Special Theory of Time - Space in One Physical Dimension With Pictures (Kinematics)

Dedicated to the 12-th Anniversary of Declaration Armenian Revolution in Science

Yerevan, Armenia - December, 2019
Authorial Publication

Ռոբերտ Նազարյան և Հայկ Նազարյան

Գաղափարագործություն

Ժամանակի և Տարածության Հայկական Հատուկ Տեսության Հիմունքները Միաչափ Տարածության Մեջ Պատկերավոր (Կինեմատիկա)

Նվիրվում է Համաշխարհային Գիտության Մեջ Հայկական Հեղափոխության Հայտարարման **12** Ամյակին

Արիվան, Արմենիա - Դեկտեմբեր, 2019թ.
Հեղինակային Հրատարակություն

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Creation of this book - “Foundation Armenian Special Theory of Time – Space in One Physical Dimension With Pictures (kinematics)" became possible by generous donations from my children:

Nazaryan Gor,
Nazaryan Nazan,
Nazaryan Ara and
Nazaryan Hayk.

I am very grateful to all of them.
We consider the publication of this book as Nazaryan family’s contribution to the renaissance of science in Armenia and the whole world.

Our scientific and political articles you can find it on the Internet here.

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Nazaryan R., UDC 530.12
Foundations Armenian Special Theory of Time–Space in One Physical Dimension With Pictures
R. Nazaryan, H. Nazaryan - Yerevan, Auth. Pub., 2019, 140 pages

First Armenian publication – June 2013, Armenia, ISBN: 978-1-4675-6080-1
Illustrated Armenian Publication (Volume A) – August 2016, Armenia, ISBN: 978-9939-0-1981-9
Illustrated English Publication (Volume A) – September 2016, Armenia, ISBN: 978-9939-0-1982-6
Illustrated Armenian Publication (Volume B) – November 2016, Armenia, ISBN: 978-9939-0-2059-4
Illustrated English Publication (Volume B) – December 2016, Armenia, ISBN: 978-9939-0-2083-9
Illustrated Armenian Publication (Volume C) – August 2019, Armenia, ISBN: 978-9939-0-3130-9
Illustrated English Publication (Volume C) – December 2019, Armenia, ISBN: 978-9939-0-3130-9

Contents

If you have the strong urge to accuse somebody for what you read here, then don't accuse us, read the sentence to mathematics. We are simply its messengers only.

Foundations Armenian Special Theory of Time - Space Is a New and Solid Mathematical Theory of Nature

1) Our created theory is new because it was created and developed between the years 2012 – 2019.
2) Our created new theory does not contradict all old and legacy theories of physics.
3) The former and legacy relativity theories are a very special case of Armenian Theory of Time–Space when universal constant coefficients are given the values $s = 0$ and $g = -1$.
4) All the formulas derived by the Armenian Theory of Time – Space, has a universal character, because those are the exact mathematical representation of the Nature (*Philosophiae naturalis principia mathematic, as Newton would say*).

My bookshelves are full of unpublished scientific papers,
that will be slowly revealed to the world's scientific community
(17 June 2019, Yerevan, Armenia)

After completing the book "Armenian Theory of Relativity", we recorded it in the US Library of Congress, on December 21, 2012, the exact day when all evil forces were preaching about the destruction of planet Earth and end of humanity.

Preface

Theoretical physics has been infected with leprosy for about 100 years and has infected with this disease all physicists as well. We are talking about the so-called "General theory of relativity". This infection distorts people's thinking about time-pace medium and makes them barren creatures. And it is no coincidence that in the last 100 years, not only have not been created new, more accurate theories of physics, but even the previously created pure theories of physics they have begun to pervert them, turning them into garbage. The exception can be considered only two quantum mechanics, created by physicists, endowed with the inertia of previous thinking, whose brains have not yet had time to catch leprosy.

Having created the Armenian Theory of Time-Space (former Armenian Theory of Relativity), I often kept myself on the fact that I, too, was not completely cleansed and cured of this alien origin leprosy and still have a long way to go.

Our theories aim to save humanity from this widespread plague and to open a new, golden era of Armenoids, free from all kinds of spiritual, mental and bodily diseases.

That is our mission. And the Creator Ara will help us.

In Armenian Special Theory of Time-Space, unlike traditional and expired relativity theories, physical quantities, observing and observed coordinate systems are described and interpreted as follows:

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1. Time and space are not uniform.
2. Time and space are not isotropic.
3. All observing systems are inertial (*according to the Armenian interpretation*).
4. All observed systems have arbitrary velocities, unless otherwise stated.
5. Reflected and inverse movements are equivalent to each other.
6. Observers and observed particles are located at the origins of their respective systems.
7. Observing systems usually will be denoted with the lower indexes λ, μ and ν .
8. The system containing the observed particle will be denoted with the lower index σ .
9. Each physical quantity describing the observed moving particle will be denoted by two lower indexes, where the first index indicating to which system the observation is made from, and the second index indicating to which system is located observed particle.
10. The movement of each particle is described not only by the observed distance, which is it's own spatial position, but also by the observed time showing its own time position on the world line.
11. In this third volume of our main research work we will write all the physical quantities in capital letters and we will call them general or canonical physical quantities, the meaning of which will become clear to readers in the following volumes, especially in the volumes devoted to our theory in three dimensional physical space and the operator algebra.
12. In the Armenian Theory of Time-Space, we recognize that incidents occur due to a causal relationship because we discuss particle motion or field propagation, and therefore the squares of the infinitesimal Armenian intervals must always be positive quantities unless otherwise stated.

Chapter 1

Armenian Interpretations of Various Described Physical Quantities From the Observing and Observed Systems

In the second volume of our main research work we discover that there is a deep mathematical crisis in the legacy theory of relativity. And in order for us to overcome this crisis, we need to reinterpret very important concepts, calling them Armenian interpretations. In this chapter we will give revolutionary interpretations of the concepts of "inertial system", "observed time" and "proper time". We also describe in great details the concepts of "transformation equations" and "reflected motions".
Only after the implementation of Armenian interpretations of the above concepts will it be possible to overcome the crisis and also solve the problem of motion system of the particles as whole.

The Discovery of a Crisis Existing In a Legacy Theory of Relativity

In the first and second volumes of our main research work - The Armenian Theory of Time-space (formerly Armenian Theory of Relativity), we use without change the axioms and concepts of legacy theory of relativity, but only with the difference that in the process of constructing the theory we were more brave, honest and sincere. It was the secret of our success in building a mathematically solid physical theory.

Here are the set of axioms which we used in our first volume

1. All fundamental physical laws have the same mathematical functional forms in all inertial systems.
2. There exists a universal constant velocity c, which has the same value in all inertial systems.
3. In all inertial systems time and space are homogeneous
4. Armenian quadratic form of infinitesimal intervals of the coordinates are invariant in all systems.

Here are the set of axioms which we used in our second volume

1. All fundamental physical laws have the same mathematical functional forms in all systems.
2. There exists a universal constant velocity c, which has the same value in all systems.
3. Armenian quadratic form of infinitesimal intervals of the coordinates are invariant in all systems.

In our first volume of the Armenian Theory of Time-Space (*Armenian Theory of Relativity*), staying within the framework of the legacy theory of relativity, we investigated the case of inertial observing systems (according to the Armenian interpretation) and obtained more general transformation equations and other important relativistic formulas, calling them Armenian Transformation Equations and Armenian Relativistic Formulas.

But in our second volume of the Armenian Theory of Time-Space (*Armenian Theory of Relativity*), also staying within the framework and concepts of the legacy theory of relativity, we investigated the case of none inertial observing systems (kinematics only) and obtained particle's infinitesimal coordinates transformation equations and other important relativistic formulas. But in this case we have also exposed that there is an inherent contradiction in the derived formulas of relative acceleration, and we have compared it with the crisis of ultraviolet radiation in the physics of the last century.

We then stated that this crisis can be overcome by revising the concept of "observed time".

The Armenian Interpretation of the Concept of “Inertial Systems”

The definition of an "inertial system" is quite a difficult task, especially if the concept of an "absolute rest coordinate system" is not established, with respect to which we can determine whether a given system is moving at a constant speed or it is moving with acceleration. The definition of an "inertial system" in legacy theory of relativity silently assumes the existence of an absolute rest system. But in the Armenian Theory of Time-Space, we do not have much need for the two observing systems to be inertial systems in the classical sense, because the process of mathematical derivation is quite sufficient that the reciprocal relative velocities of these two observing systems are constant quantities. Systems endowed with such properties, we will call inertial-like systems, henceforth inertial systems according to the Armenian interpretation.

What is the Concept of "Observed Time“ in the Armenian Theory of Time – Space?

Understanding the concept "observed time" of a moving particle or any incident in the literature dedicated to the legacy theory of relativity is so complicated and confusing that are very hard to understand, so I'll try to explain it to readers in plain language how I understand it. First, we will confirm the fact that the observer is in the laboratory system and the observed particle is in another system. The legacy theory of relativity states that the observed time of a moving particle cannot be measured, and it can only be calculated using Lorentz invariant proper time and the well known formula. But according to its habit, the legacy theory of relativity is stubbornly silent about the important fact that used "observed time" quantity itself has already considered silently as the own time of the observing system. The Lorentz transformation equations are direct proofs of this. This unadulterated fact in the legacy theory of relativity led us to the crisis which we already discussed. We can emerge victorious from the above mentioned crisis by re-defining notations and interpreting the concept of "observed time". To do this, the coordinates of the observed particle - observed time and spatial location of particle on world-line, we will denote them with two lower indexes. The first index will indicate who is the observing system (laboratory) and the second index will indicate in which system the particle is located. As we will see in the chapter "Appendix 2" of this third volume of our main research work, the Armenian interpretation of the concept of "observed time" completely solves the identified crisis and opens up new perspectives for a complete study and solution of the problem of particles system motion. In addition, it is extremely necessary for us to correctly determine and calculate the observed time of the moving particle, because these are the quantities which are used in the transformation equations of the particle coordinates.

Armenian Interpretation of “Own Time (Proper Time)”

Now we want to talk about another important concept - the “own time”, or more known as “proper time”, which is an invariant quantity independent of observation systems, and in the legacy theory of relativity is called as Lorentz invariant time. It should also be noted that in legacy theory of relativity, instead of using the understandable term "own time", for some unknown reason the French-Latin version - the term "proper time“ was used, thus depriving us of the ability to grasp the true physical meaning of the phenomenon. In the Armenian Theory of Time-Space, we always use the term "own time" and since it is a invariant quantity, therefore this fact is the basis for us to introduce the concept of the absolute-like time, hereafter absolute time. After that we naturally define the concept of absolute physical quantities and express them by corresponding non-absolute, hence local, physical quantities, and also obtain the transformation equations of these newly introduced absolute physical quantities.

In this third volume of our main research work, we recognize that all observing and observed systems have the same "weight", that is, all these systems are in some sense equivalent to each other and, therefore, this is the reason that the own (proper) times of all observing and observed systems are also equal to each other. But in the following volumes of our research work, all observing and observed systems will have different "weights", and therefore, for calculation of the particle’s observed time, definitely, we must use the own time of the observing system, which is a very natural reality.

The Existence of Two Types of Transformations Which are Qualitatively Different From Each Other

In the Armenian Theory of Time-Space, we discussed that there are two qualitatively different types of transformations. The transformation of the first type is the case when two systems mutually observe each other motion and obtain transformation equations for the systems origins coordinates. A transformation of the second type is the case when two different systems observing the motion of particle located at the origin of another system, and obtain the transformation equations of the particle coordinates.

It is not possible to obtain first type of transformation equations from the second type of transformation equations and vice versa. But from the observed particle velocity transformation relations, as a special case, it is possible to obtain the transformation relations relative velocities of the origins of the reciprocally observed systems.

Proponents of the legacy theory of relativity have no idea of the existence of such transformations, and quietly enjoy their ignorance, while sticking their heads in the sand.

What are the Transformation Equations?

Suppose we have two observing (laboratory) systems, which we will for now conditionally call the first and second observing systems. In the meantime, from these two observing systems "simultaneously" we observe the behavior of a moving particle, which, of course, is located in another system. Suppose that the first and second observers at some point measure the coordinates of a moving particle (the particle's location in two dimensional time-space), and also they measure the mutual relative velocities of the observing two systems. In such a case, for example, the observer of the first system may surprise the observer of the second system by declaring that he has a magical toolkit with which he can accurately state what observing results he has recorded when he measured the corresponding quantities. The first observer can also surprise the second observer by predicting the measured values of the various physical quantities of the particle: velocity, acceleration, energy and momentum. A second system observer can do likewise, saying that he also has the magic tools with which he can accurately "guess" the values measured by the observer of the first system.

These magical tools, through which observers can predict the measurements of an observer in another system, are the direct and inverse transformation equations of the corresponding physical quantities. And the paradoxes of the "simultaneous" and other difficult understandings used above will disappear when we further define the idea of a universal absolute rest system in the upcoming volumes of our research and, therefore, we will also define the concept of “universal absolute time”. In the Armenian Theory of Time-Space, the transformation equations of different physical quantities of a particle have a universal character, that is, they have the same mathematical structure, regardless of whether the observing systems are inertial or not. In the case of inertial observing systems, the usual known physical quantities are used in the transformation equations of different physical quantities of a particle. And in the case of non-inertial observing systems, generalized versions of the corresponding physical quantities of the particle will be used in different transformation equations, but in both cases the mathematical structure of the transformation equations will remain unchanged, as we will witness in future volumes.

And when in the corresponding chapter we define the components of absolute physical quantities, the transformation equations of these components will also have the mathematical structure of the transformation equations of the particle coordinates, only with the difference that the transformation coefficients will be expressed in the components of the absolute velocity.

Proponents of legacy theories of relativity also have no idea about the existence of such transformations and quietly enjoy being in their ignorant state.

What are the Direct and Reflected Movements?

Physicists study the properties of the universe's symmetry and asymmetry to better understand the laws governing nature, and then, using these studies, they try to build new theories that can best explain the spiritual and material laws of the world around us-from the Macro World to the Micro World and back to the Macro World again. It is precisely the question of symmetry and asymmetry that we want to discuss and see how this problem is solved in the Armenian Theory of Time-Space.

Henceforth we will call the motion of a real particle - direct motion of a particle and henceforth we will call the motion of a plane mirror-reflected particle - reflected motion of a particle. And according to the Armenian Theory of Time-Space, it can be proved that the fundamental laws of nature and the transformation equations of different physical quantities of the particle, in the case of the direct and reflected motion of the particle, have the same mathematical form. We will call this provision the Armenian interpretation of the particle movement. We also want to emphasize the fact of adequacy of reflected motion and inverse motion, which can very easily be implemented in the Armenian Theory of Time-Space, simply by swapping the positions of the lower two indexes of any physical quantity.

In modern physics, it is also of great importance to discuss the phenomena of only time reversal or only the spatial direction reversal, or to discuss the phenomenon of the simultaneous reversal of time and space, in which cases the mathematical form of transformation equations for the physical quantities and other important formulas must remain unchanged.

In the Armenian Theory of Time-Space, the above requirements are preserved, because in the case of time reversal ($t \rightarrow -t$) all the basic physical quantities that are not derived from time derivatives, their signs remain unchanged, for example the particle spatial coordinate ($x \rightarrow x$), the mass ($m \rightarrow m$) and the charge ($q \rightarrow q$). And those physical quantities, which are derived from the odd-numbered derivatives of time, change their signs, such as the particle velocity ($u \rightarrow -u$). But those physical quantities that are derived from the even-numbered derivatives of time, their signs also remain unchanged, for example, the acceleration of the particle ($a \rightarrow a$). Besides that, what deserves attention is the important fact that, in the case of a reversal of the direction of time or space, the signs of our newly defined s and g universal constant quantities changed as follows. Only in case of time reversal there is a change of a sign ($s \dashrightarrow -s$), and in all other cases the signs of s and g are preserved.

And the action of the reversal of the direction of space is actually a more complex physical phenomenon than the reversal of the direction of time. You can read in more detail about all this in our article: "The problem of time direction reversal and space reflection in Armenian Theory of Relativity", December 2014.

Chapter 2

Definitions and Notations of Physical Quantities in the Armenian Theory of Time - Space

In the "Armenian Theory of Time-Space" we will use two types of coordinates: general coordinates and canonical coordinates, the meaning of which will become clear in subsequent volumes, especially in volumes devoted to the study of time and space in three-dimensional physical world. Naturally these rules will apply to notations of all other physical quantities as well. In this third volume of our research we will use only canonical coordinates, not particularly emphasizing this fact and denoting all such physical quantities in capital letters.

Notations of Observing and Observed Systems In the Armenian Theory of Time - Space

➤ *The existence of two types of coordinates in the Armenian Theory of Time-Space and their names and notations*

1. General or canonical coordinates, which are denoted by a capital letters
2. The most general coordinates, which are denoted by a small letters

2_01

➤ *Notations of the observing systems which we will use in the Armenian Theory of Time-Space*

Notation of the λ-th observing inertial system $\rightarrow$ K_λ

Notation of the μ-th observing inertial system $\rightarrow$ K_μ

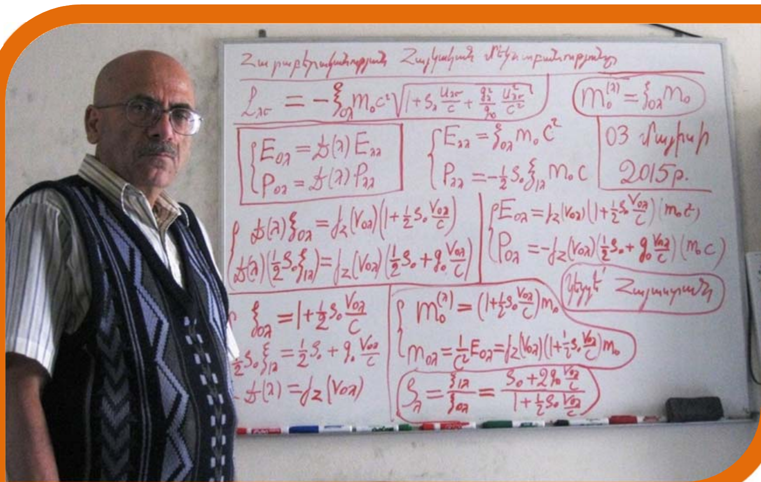
Notation of the ν-th observing inertial system $\rightarrow$ K_ν

2_02

➤ *Notation of the observed system containing the particle* σ

Notation of the σ-th observed none inertial system $\rightarrow$ K_σ

2_03



2_04

Armenian interpretation of Newton's laws of mechanics and dynamics
(09 July 2015, Glendale, USA)

Notations of Particle's Direct and Reflected Observed Coordinates and Comparison of Different Observed Times

- *Reciprocal observed origins of inertial coordinates systems of λ and μ*

2_05

Coordinates of origin K_μ observed from K_λ			Coordinates of origin K_λ observed from K_μ	
Observed time coordinates	$\rightarrow T_{\lambda\mu}$	and	Observed time coordinates	$\rightarrow T_{\mu\lambda}$
Observed spatial coordinates	$\rightarrow X_{\lambda\mu}$		Observed spatial coordinates	$\rightarrow X_{\mu\lambda}$

- *The direct and reflected coordinates of the particle σ located at the origin of moving system, with respect to the inertial observing system λ*

2_06

In the case of direct movement of a particle			In the case of reflected movement of a particle	
Observed time coordinates	$\rightarrow T_{\lambda\sigma}$	and	Observed time coordinates	$\rightarrow T_{\sigma\lambda}$
Observed spatial coordinates	$\rightarrow X_{\lambda\sigma}$		Observed spatial coordinates	$\rightarrow X_{\sigma\lambda}$

- *The direct and reflected coordinates of the particle σ located at the origin of moving system, with respect to the inertial observation system μ*

2_07

In the case of direct movement of a particle			In the case of reflected movement of a particle	
Observed time coordinates	$\rightarrow T_{\mu\sigma}$	and	Observed time coordinates	$\rightarrow T_{\sigma\mu}$
Observed spatial coordinates	$\rightarrow X_{\mu\sigma}$		Observed spatial coordinates	$\rightarrow X_{\sigma\mu}$

- *Different notations of the observed coordinate times of a moving particles from the same observing system, although the observed coordinate times of different particles from the same system have different rates and values, therefore they are not equal to each other*

2_08

Observed times respect to system K_λ	$T_{\lambda\mu}$	and	$T_{\lambda\sigma}$	$\rightarrow$	$T_{\lambda\mu} \neq T_{\lambda\sigma}$
Observed times respect to system K_μ	$T_{\mu\lambda}$	and	$T_{\mu\sigma}$	$\rightarrow$	$T_{\mu\lambda} \neq T_{\mu\sigma}$
Observed times respect to system K_σ	$T_{\sigma\lambda}$	and	$T_{\sigma\mu}$	$\rightarrow$	$T_{\sigma\lambda} \neq T_{\sigma\mu}$

Notations of Observed Velocities and Accelerations

- *Notations and definitions of the direct and inverse movement quantities for reciprocally observed inertial systems* λ *and* μ

In the case of direct movement — In the case of inverse movement

$$\left\{\begin{array}{lll}\text{Velocity} & \rightarrow & V_{\lambda\mu} = \dfrac{dX_{\lambda\mu}}{dT_{\lambda\mu}} \\ \text{Acceleration} & \rightarrow & A_{\lambda\mu} = \dfrac{dV_{\lambda\mu}}{dT_{\lambda\mu}}\end{array}\right. \quad \text{and} \quad \left\{\begin{array}{lll}\text{Velocity} & \rightarrow & V_{\mu\lambda} = \dfrac{dX_{\mu\lambda}}{dT_{\mu\lambda}} \\ \text{Acceleration} & \rightarrow & A_{\mu\lambda} = \dfrac{dV_{\mu\lambda}}{dT_{\mu\lambda}}\end{array}\right. \qquad 2\_09$$

- *Notations and definitions of the direct and reflected movement quantities of the observed particle* σ *with respect to the inertial observing system* λ

In the case of direct movement of a particle σ — In the case of reflected movement of a particle σ

$$\left\{\begin{array}{lll}\text{Velocity} & \rightarrow & U_{\lambda\sigma} = \dfrac{dX_{\lambda\sigma}}{dT_{\lambda\sigma}} \\ \text{Acceleration} & \rightarrow & B_{\lambda\sigma} = \dfrac{dU_{\lambda\sigma}}{dT_{\lambda\sigma}}\end{array}\right. \quad \text{and} \quad \left\{\begin{array}{lll}\text{Velocity} & \rightarrow & U_{\sigma\lambda} = \dfrac{dX_{\sigma\lambda}}{dT_{\sigma\lambda}} \\ \text{Acceleration} & \rightarrow & B_{\sigma\lambda} = \dfrac{dU_{\sigma\lambda}}{dT_{\sigma\lambda}}\end{array}\right. \qquad 2\_10$$

- *Notations and definitions of the direct and reflected movement quantities of the observed particle* σ *with respect to the inertial observing system* μ

In the case of direct movement of a particle σ — In the case of reflected movement of a particle σ

$$\left\{\begin{array}{lll}\text{Velocity} & \rightarrow & U_{\mu\sigma} = \dfrac{dX_{\mu\sigma}}{dT_{\mu\sigma}} \\ \text{Acceleration} & \rightarrow & B_{\mu\sigma} = \dfrac{dU_{\mu\sigma}}{dT_{\mu\sigma}}\end{array}\right. \quad \text{and} \quad \left\{\begin{array}{lll}\text{Velocity} & \rightarrow & U_{\sigma\mu} = \dfrac{dX_{\sigma\mu}}{dT_{\sigma\mu}} \\ \text{Acceleration} & \rightarrow & B_{\sigma\mu} = \dfrac{dU_{\sigma\mu}}{dT_{\sigma\mu}}\end{array}\right. \qquad 2\_11$$

Notations of the Rest Particle Own Values of Coordinates, Velocities and Accelerations

- *Notations of the rest particle own values of infinitesimal coordinates with respect to inertial observing system* λ

2_12

$$\begin{cases} \text{Particle infinitesimal own time value} & \rightarrow dT_{\lambda\lambda} := d\tau_{\lambda} \neq 0 \\ \text{Particle infinitesimal spatial displacement value} & \rightarrow dX_{\lambda\lambda} := dX_{\lambda} = 0 \end{cases}$$

- *Notations of the rest particle own values of infinitesimal coordinates with respect to inertial observing system* μ

2_13

$$\begin{cases} \text{Particle infinitesimal own time value} & \rightarrow dT_{\mu\mu} := d\tau_{\mu} \neq 0 \\ \text{Particle infinitesimal spatial displacement value} & \rightarrow dX_{\mu\mu} := dX_{\mu} = 0 \end{cases}$$

- *Notations of the rest particle own values of infinitesimal coordinates with respect to observed system* σ

2_14

$$\begin{cases} \text{Particle infinitesimal own time value} & \rightarrow dT_{\sigma\sigma} := d\tau_{\sigma} \neq 0 \\ \text{Particle infinitesimal spatial displacement value} & \rightarrow dX_{\sigma\sigma} := dX_{\sigma} = 0 \end{cases}$$

- *Notations of the own values of velocities and accelerations of the rest particle, located at the origin of the systems* λ, μ *and* σ

2_15

Own values of particle velocities — Own values of particle accelerations

$$\begin{cases} \text{In the system } K_{\lambda} \longrightarrow U_{\lambda\lambda} = 0 \\ \text{In the system } K_{\mu} \longrightarrow U_{\mu\mu} = 0 \\ \text{In the system } K_{\sigma} \longrightarrow U_{\sigma\sigma} = 0 \end{cases} \quad \text{and} \quad \begin{cases} \text{In the system } K_{\lambda} \longrightarrow B_{\lambda\lambda} = 0 \\ \text{In the system } K_{\mu} \longrightarrow B_{\mu\mu} = 0 \\ \text{In the system } K_{\sigma} \longrightarrow B_{\sigma\sigma} = 0 \end{cases}$$

Notations of Other Important Quantities

➢ *Notations determinants of the first and second types of transformation equations*

$$\begin{cases} \text{In the case of first type transformation} \quad D^1_{\lambda\mu} \quad \text{and} \quad D^1_{\mu\lambda} \\ \text{In the case of second type transformation} \quad D^2_{\lambda\mu} \quad \text{and} \quad D^2_{\mu\lambda} \end{cases}$$ 2_16

➢ *Notations for infinitesimal Armenian intervals in the case of first and second type of transformations*

$$\begin{cases} \text{In the case of first type transformation} \quad d\text{Ե}_{\lambda\mu} \quad \text{and} \quad d\text{Ե}_{\mu\lambda} \\ \text{In the case of second type transformation} \quad d\text{Ե}_{\lambda\sigma} \quad \text{and} \quad d\text{Ե}_{\mu\sigma} \end{cases}$$ 2_17

➢ *Notation for infinitesimal Armenian invariant interval*

$$\text{The infinitesimal Armenian invariant interval} \quad \rightarrow \quad d\text{Ե}_{\text{չ}}$$ 2_18

➢ *Notation for infinitesimal absolute time*

$$\text{The infinitesimal absolute time} \quad \rightarrow \quad d\tau$$ 2_19

Notations and Definitions of Scalar and Spatial Components of Absolute Velocities

➢ *Notations and definitions of the scalar and spatial components of absolute relative velocities in the case of reciprocal observing inertial systems λ and μ*

2_20

In the case of direct movement		In the case of inverse movement
$\begin{cases} V^0_{\text{ϱ}\lambda\mu} = \dfrac{d(cT_{\lambda\mu})}{d\tau} \\ V^1_{\text{ϱ}\lambda\mu} = \dfrac{dX_{\lambda\mu}}{d\tau} \end{cases}$	and	$\begin{cases} V^0_{\text{ϱ}\mu\lambda} = \dfrac{d(cT_{\mu\lambda})}{d\tau} \\ V^1_{\text{ϱ}\mu\lambda} = \dfrac{dX_{\mu\lambda}}{d\tau} \end{cases}$

➢ *Notations and definitions of the scalar and spatial components of the direct and reflected absolute velocities of a particle σ located at the origin of the observed system, with respect to inertial observing system λ*

2_21

In the case of direct movement of a particle σ		In the case of reflected movement of a particle σ
$\begin{cases} U^0_{\text{ϱ}\lambda\sigma} = \dfrac{d(cT_{\lambda\sigma})}{d\tau} \\ U^1_{\text{ϱ}\lambda\sigma} = \dfrac{dX_{\lambda\sigma}}{d\tau} \end{cases}$	and	$\begin{cases} U^0_{\text{ϱ}\sigma\lambda} = \dfrac{d(cT_{\sigma\lambda})}{d\tau} \\ U^1_{\text{ϱ}\sigma\lambda} = \dfrac{dX_{\sigma\lambda}}{d\tau} \end{cases}$

➢ *Notations and definitions of the scalar and spatial components of the direct and reflected absolute velocities of a particle σ located at the origin of the observed system, with respect to inertial observing system μ*

2_22

In the case of direct movement of a particle σ		In the case of reflected movement of a particle σ
$\begin{cases} U^0_{\text{ϱ}\mu\sigma} = \dfrac{d(cT_{\mu\sigma})}{d\tau} \\ U^1_{\text{ϱ}\mu\sigma} = \dfrac{dX_{\mu\sigma}}{d\tau} \end{cases}$	and	$\begin{cases} U^0_{\text{ϱ}\sigma\mu} = \dfrac{d(cT_{\sigma\mu})}{d\tau} \\ U^1_{\text{ϱ}\sigma\mu} = \dfrac{dX_{\sigma\mu}}{d\tau} \end{cases}$

Notations and Definitions of Scalar and Spatial Components of Absolute Accelerations

- *Notations and definitions of the scalar and spatial components of absolute relative accelerations in the case of reciprocal observing inertial systems* λ *and* μ

In the case of direct movement and In the case of inverse movement

$$\begin{cases} A^0_{\rho\lambda\mu} = \dfrac{dV^0_{\rho\lambda\mu}}{d\tau} \\ A^1_{\rho\lambda\mu} = \dfrac{dV^1_{\rho\lambda\mu}}{d\tau} \end{cases} \quad \text{and} \quad \begin{cases} A^0_{\rho\mu\lambda} = \dfrac{dV^0_{\rho\mu\lambda}}{d\tau} \\ A^1_{\rho\mu\lambda} = \dfrac{dV^1_{\rho\mu\lambda}}{d\tau} \end{cases}$$ 2_23

- *Notations and definitions of the scalar and spatial components of the direct and reflected absolute accelerations of a particle* σ *located at the origin of the observed system, with respect to inertial observing system* λ

In the case of direct movement of a particle σ and In the case of reflected movement of a particle σ

$$\begin{cases} B^0_{\rho\lambda\sigma} = \dfrac{dU^0_{\rho\lambda\sigma}}{d\tau} \\ B^1_{\rho\lambda\sigma} = \dfrac{dU^1_{\rho\lambda\sigma}}{d\tau} \end{cases} \quad \text{and} \quad \begin{cases} B^0_{\rho\sigma\lambda} = \dfrac{dU^0_{\rho\sigma\lambda}}{d\tau} \\ B^1_{\rho\sigma\lambda} = \dfrac{dU^1_{\rho\sigma\lambda}}{d\tau} \end{cases}$$ 2_24

- *Notations and definitions of the scalar and spatial components of the direct and reflected absolute accelerations of a particle* σ *located at the origin of the observed system, with respect to inertial observing system* μ

In the case of direct movement of a particle σ and In the case of reflected movement of a particle σ

$$\begin{cases} B^0_{\rho\mu\sigma} = \dfrac{dU^0_{\rho\mu\sigma}}{d\tau} \\ B^1_{\rho\mu\sigma} = \dfrac{dU^1_{\rho\mu\sigma}}{d\tau} \end{cases} \quad \text{and} \quad \begin{cases} B^0_{\rho\sigma\mu} = \dfrac{dU^0_{\rho\sigma\mu}}{d\tau} \\ B^1_{\rho\sigma\mu} = \dfrac{dU^1_{\rho\sigma\mu}}{d\tau} \end{cases}$$ 2_25

Chapter 3

Existence of Qualitatively Different Two Types of Possible Transformations in the Armenian Theory of Time - Space

1. The first type of possible transformation
   This is the case when two different systems reciprocally observing the movement of coordinates they origins.

2. The second type of possible transformation
   This is the case when from the origins of two different systems observing the movement of particle coordinates located at the third system origin.

The Existence of Qualitatively Different Two Types of Possible Transformations and Their Initial Explicit Functional Dependencies

- *The coordinates transformations of reciprocally observed origins of the systems λ and μ we will call first type of transformations and an explicit form of a such transformation equations are*

Direct transformation equations | Inverse transformation equations

$$\begin{cases} T_{\mu\lambda} = R^{T}_{\lambda\mu}(T_{\lambda\mu}, X_{\lambda\mu}, V_{\lambda\mu}) \\ X_{\mu\lambda} = R^{X}_{\lambda\mu}(T_{\lambda\mu}, X_{\lambda\mu}, V_{\lambda\mu}) \end{cases} \quad \text{and} \quad \begin{cases} T_{\lambda\mu} = R^{T}_{\mu\lambda}(T_{\mu\lambda}, X_{\mu\lambda}, V_{\mu\lambda}) \\ X_{\lambda\mu} = R^{X}_{\mu\lambda}(T_{\mu\lambda}, X_{\mu\lambda}, V_{\mu\lambda}) \end{cases}$$ 3_01

- *The observed particle coordinates transformations from observing systems λ and μ we will call the second type of transformations and an explicit form of a such transformation equations are*

Direct transformation equations | Inverse transformation equations

$$\begin{cases} T_{\mu\sigma} = G^{T}_{\lambda\mu}(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}) \\ X_{\mu\sigma} = G^{X}_{\lambda\mu}(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}) \end{cases} \quad \text{and} \quad \begin{cases} T_{\lambda\sigma} = G^{T}_{\mu\lambda}(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}) \\ X_{\lambda\sigma} = G^{X}_{\mu\lambda}(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}) \end{cases}$$ 3_02

The above functions with the capital letters R and G mean:
R - uppercase function denotes reciprocal
G - uppercase function denotes general
These mentioned functions depend only on the particle coordinates and the relative velocities of the observing systems. 3_03

The researchers who located at the origins of the systems λ and μ, in the first case, they make reciprocal observations, and in the second case, they observe the movement of the particle σ which is located at the origin of the different observed system. Therefore, in both of the mentioned cases, our goal is to derive the general transformation equations of the appropriate coordinates. 3_04

Two Types of Transformation Equations Expanded in the Form of Differentials

➢ *First type of direct transformation equations expanded in the form of differentials*

3_05

$$\begin{cases} dT_{\mu\lambda} = \dfrac{\partial R^{T}_{\lambda\mu}}{\partial T_{\lambda\mu}} dT_{\lambda\mu} + \dfrac{\partial R^{T}_{\lambda\mu}}{\partial X_{\lambda\mu}} dX_{\lambda\mu} + \dfrac{\partial R^{T}_{\lambda\mu}}{\partial V_{\lambda\mu}} dV_{\lambda\mu} \\ dX_{\mu\lambda} = \dfrac{\partial R^{X}_{\lambda\mu}}{\partial T_{\lambda\mu}} dT_{\lambda\mu} + \dfrac{\partial R^{X}_{\lambda\mu}}{\partial X_{\lambda\mu}} dX_{\lambda\mu} + \dfrac{\partial R^{X}_{\lambda\mu}}{\partial V_{\lambda\mu}} dV_{\lambda\mu} \end{cases}$$

➢ *First type of inverse transformation equations expanded in the form of differentials*

3_06

$$\begin{cases} dT_{\lambda\mu} = \dfrac{\partial R^{T}_{\mu\lambda}}{\partial T_{\mu\lambda}} dT_{\mu\lambda} + \dfrac{\partial R^{T}_{\mu\lambda}}{\partial X_{\mu\lambda}} dX_{\mu\lambda} + \dfrac{\partial R^{T}_{\mu\lambda}}{\partial V_{\mu\lambda}} dV_{\mu\lambda} \\ dX_{\lambda\mu} = \dfrac{\partial R^{X}_{\mu\lambda}}{\partial T_{\mu\lambda}} dT_{\mu\lambda} + \dfrac{\partial R^{X}_{\mu\lambda}}{\partial X_{\mu\lambda}} dX_{\mu\lambda} + \dfrac{\partial R^{X}_{\mu\lambda}}{\partial V_{\mu\lambda}} dV_{\mu\lambda} \end{cases}$$

➢ *Second type of direct transformation equations expanded in the form of differentials*

3_07

$$\begin{cases} dT_{\mu\sigma} = \dfrac{\partial G^{T}_{\lambda\mu}}{\partial T_{\lambda\sigma}} dT_{\lambda\sigma} + \dfrac{\partial G^{T}_{\lambda\mu}}{\partial X_{\lambda\sigma}} dX_{\lambda\sigma} + \dfrac{\partial G^{T}_{\lambda\mu}}{\partial V_{\lambda\mu}} dV_{\lambda\mu} \\ dX_{\mu\sigma} = \dfrac{\partial G^{X}_{\lambda\mu}}{\partial T_{\lambda\sigma}} dT_{\lambda\sigma} + \dfrac{\partial G^{X}_{\lambda\mu}}{\partial X_{\lambda\sigma}} dX_{\lambda\sigma} + \dfrac{\partial G^{X}_{\lambda\mu}}{\partial V_{\lambda\mu}} dV_{\lambda\mu} \end{cases}$$

➢ *Second type of inverse transformation equations expanded in the form of differentials*

3_08

$$\begin{cases} dT_{\lambda\sigma} = \dfrac{\partial G^{T}_{\mu\lambda}}{\partial T_{\mu\sigma}} dT_{\mu\sigma} + \dfrac{\partial G^{T}_{\mu\lambda}}{\partial X_{\mu\sigma}} dX_{\mu\sigma} + \dfrac{\partial G^{T}_{\mu\lambda}}{\partial V_{\mu\lambda}} dV_{\mu\lambda} \\ dX_{\lambda\sigma} = \dfrac{\partial G^{X}_{\mu\lambda}}{\partial T_{\mu\sigma}} dT_{\mu\sigma} + \dfrac{\partial G^{X}_{\mu\lambda}}{\partial X_{\mu\sigma}} dX_{\mu\sigma} + \dfrac{\partial G^{X}_{\mu\lambda}}{\partial V_{\mu\lambda}} dV_{\mu\lambda} \end{cases}$$

Notations and Definitions of the Coefficients For the First Type of Transformation

- *Notations and definitions of alpha and eta coefficients of direct transformation equations for infinitesimal coordinates of reciprocal observed systems* λ *and* μ

Definition of alfa coefficients and Definition of eta coefficients

$$\begin{cases} \dfrac{\partial R^{\mathrm{T}}_{\lambda\mu}}{\partial T_{\lambda\mu}} := \alpha^{1}_{\lambda\mu} \\ \dfrac{\partial R^{\mathrm{T}}_{\lambda\mu}}{\partial X_{\lambda\mu}} := \alpha^{2}_{\lambda\mu} \\ \dfrac{\partial R^{\mathrm{T}}_{\lambda\mu}}{\partial V_{\lambda\mu}} := \alpha^{3}_{\lambda\mu} \end{cases} \quad \text{and} \quad \begin{cases} \dfrac{\partial R^{\mathrm{X}}_{\lambda\mu}}{\partial T_{\lambda\mu}} := \eta^{1}_{\lambda\mu} \\ \dfrac{\partial R^{\mathrm{X}}_{\lambda\mu}}{\partial X_{\lambda\mu}} := \eta^{2}_{\lambda\mu} \\ \dfrac{\partial R^{\mathrm{X}}_{\lambda\mu}}{\partial V_{\lambda\mu}} := \eta^{3}_{\lambda\mu} \end{cases}$$ 3_09

- *Notations and definitions of alpha and eta coefficients of inverse transformation equations for infinitesimal coordinates of reciprocal observed systems* λ *and* μ

Definition of alfa coefficients and Definition of eta coefficients

$$\begin{cases} \dfrac{\partial R^{\mathrm{T}}_{\mu\lambda}}{\partial T_{\mu\lambda}} := \alpha^{1}_{\mu\lambda} \\ \dfrac{\partial R^{\mathrm{T}}_{\mu\lambda}}{\partial X_{\mu\lambda}} := \alpha^{2}_{\mu\lambda} \\ \dfrac{\partial R^{\mathrm{T}}_{\mu\lambda}}{\partial V_{\mu\lambda}} := \alpha^{3}_{\mu\lambda} \end{cases} \quad \text{and} \quad \begin{cases} \dfrac{\partial R^{\mathrm{X}}_{\mu\lambda}}{\partial T_{\mu\lambda}} := \eta^{1}_{\mu\lambda} \\ \dfrac{\partial R^{\mathrm{X}}_{\mu\lambda}}{\partial X_{\mu\lambda}} := \eta^{2}_{\mu\lambda} \\ \dfrac{\partial R^{\mathrm{X}}_{\mu\lambda}}{\partial V_{\mu\lambda}} := \eta^{3}_{\mu\lambda} \end{cases}$$ 3_10

 3_11

Paying My Respects to Fallen Heroes at Yerablur
(09 May 2016, Yerevan, Armenia)

Notations and Definitions of the Coefficients For the Second Type of Transformation

- *Notations and definitions of the beta and gamma coefficients of direct transformation equations for infinitesimal coordinates of the observed particle σ respect to observing system λ*

3_12

Definition of beta coefficients and Definition of gamma coefficients

$$\begin{cases} \dfrac{\partial G^{T}_{\lambda\mu}}{\partial T_{\lambda\sigma}} := \mathcal{B}^{1}_{\lambda\mu} \\ \dfrac{\partial G^{T}_{\lambda\mu}}{\partial X_{\lambda\sigma}} := \mathcal{B}^{2}_{\lambda\mu} \\ \dfrac{\partial G^{T}_{\lambda\mu}}{\partial V_{\lambda\mu}} := \mathcal{B}^{3}_{\lambda\mu} \end{cases} \quad \text{and} \quad \begin{cases} \dfrac{\partial G^{X}_{\lambda\mu}}{\partial T_{\lambda\sigma}} := \Gamma^{1}_{\lambda\mu} \\ \dfrac{\partial G^{X}_{\lambda\mu}}{\partial X_{\lambda\sigma}} := \Gamma^{2}_{\lambda\mu} \\ \dfrac{\partial G^{X}_{\lambda\mu}}{\partial V_{\lambda\mu}} := \Gamma^{3}_{\lambda\mu} \end{cases}$$

- *Notations and definitions of the beta and gamma coefficients of inverse transformation equations for infinitesimal coordinates of the observed particle σ respect to observing system μ*

3_13

Definition of beta coefficients and Definition of gamma coefficients

$$\begin{cases} \dfrac{\partial G^{T}_{\mu\lambda}}{\partial T_{\mu\sigma}} := \mathcal{B}^{1}_{\mu\lambda} \\ \dfrac{\partial G^{T}_{\mu\lambda}}{\partial X_{\mu\sigma}} := \mathcal{B}^{2}_{\mu\lambda} \\ \dfrac{\partial G^{T}_{\mu\lambda}}{\partial V_{\mu\lambda}} := \mathcal{B}^{3}_{\mu\lambda} \end{cases} \quad \text{and} \quad \begin{cases} \dfrac{\partial G^{X}_{\mu\lambda}}{\partial T_{\mu\sigma}} := \Gamma^{1}_{\mu\lambda} \\ \dfrac{\partial G^{X}_{\mu\lambda}}{\partial X_{\mu\sigma}} := \Gamma^{2}_{\mu\lambda} \\ \dfrac{\partial G^{X}_{\mu\lambda}}{\partial V_{\mu\lambda}} := \Gamma^{3}_{\mu\lambda} \end{cases}$$

3_14

In order not to complicate new defined second type of transformation beta and gamma coefficients, we did not use the σ index, since, as will become clear later, the expressions of the coefficients depend only on the corresponding relative velocities between observation systems, which means that these coefficients must have only λ and μ indexes, denoting the observing systems.

First and Second Type of Transformation Equations Expressed with a New Defined Coefficients

- *A complete view of the first type of direct transformation equations expressed with new defined coefficients*

$$\begin{cases} dT_{\mu\lambda} = \alpha^1_{\lambda\mu} dT_{\lambda\mu} + \alpha^2_{\lambda\mu} dX_{\lambda\mu} + \alpha^3_{\lambda\mu} dV_{\lambda\mu} \\ dX_{\mu\lambda} = \eta^1_{\lambda\mu} dT_{\lambda\mu} + \eta^2_{\lambda\mu} dX_{\lambda\mu} + \eta^3_{\lambda\mu} dV_{\lambda\mu} \end{cases} \quad 3\_15$$

- *A complete view of the first type of inverse transformation equations expressed with new defined coefficients*

$$\begin{cases} dT_{\lambda\mu} = \alpha^1_{\mu\lambda} dT_{\mu\lambda} + \alpha^2_{\mu\lambda} dX_{\mu\lambda} + \alpha^3_{\mu\lambda} dV_{\mu\lambda} \\ dX_{\lambda\mu} = \eta^1_{\mu\lambda} dT_{\mu\lambda} + \eta^2_{\mu\lambda} dX_{\mu\lambda} + \eta^3_{\mu\lambda} dV_{\mu\lambda} \end{cases} \quad 3\_16$$

- *A complete view of the second type of direct transformation equations expressed with new defined coefficients*

$$\begin{cases} dT_{\mu\sigma} = B^1_{\lambda\mu} dT_{\lambda\sigma} + B^2_{\lambda\mu} dX_{\lambda\sigma} + B^3_{\lambda\mu} dV_{\lambda\mu} \\ dX_{\mu\sigma} = \Gamma^1_{\lambda\mu} dT_{\lambda\sigma} + \Gamma^2_{\lambda\mu} dX_{\lambda\sigma} + \Gamma^3_{\lambda\mu} dV_{\lambda\mu} \end{cases} \quad 3\_17$$

- *A complete view of the second type of inverse transformation equations expressed with new defined coefficients*

$$\begin{cases} dT_{\lambda\sigma} = B^1_{\mu\lambda} dT_{\mu\sigma} + B^2_{\mu\lambda} dX_{\mu\sigma} + B^3_{\mu\lambda} dV_{\mu\lambda} \\ dX_{\lambda\sigma} = \Gamma^1_{\mu\lambda} dT_{\mu\sigma} + \Gamma^2_{\mu\lambda} dX_{\mu\sigma} + \Gamma^3_{\mu\lambda} dV_{\mu\lambda} \end{cases} \quad 3\_18$$

Chapter 4

The Axioms of the Armenian Theory of Time – Space and the Two Cases of Transformation Equations Depending on the Nature of the Observing Systems

In this third volume, just as in the first volume of Armenian Theory of Time-Space (former Armenian Theory of Relativity), we will discuss the case of inertial observing systems. In the second volume and in subsequent volumes we will discuss the case when observing systems are not inertial. Although from the point of view of kinematics, the nature of observing systems is not so important, especially since the transformation equations of physical quantities we obtain in the form of infinitesimals (in differentials).

Axioms of the Armenian Special Theory of Time - Space and the Initial State Condition

➢ *Axioms of the Armenian Special Theory of Time-Space*

1. The squares of the infinitesimal Armenian interval between two infinitely close incidents, as a distance in two-dimensional time-space, are the same in all observing and observed systems.
2. The physical quantities obtained by time derivatives have universal boundaries whose quantities have the same value in all observing and observed systems (c - for velocity, a - for acceleration and so on).

4_01

➢ *"Armenian Theory of Time-space" abandons three important axioms of the legacy theory of relativity as an obsolete*

- In this third volume of our research work we suspended the principle of "relativity" as unnecessary and instead, as an important axiom, we have adopted the universal nature of the infinitesimal Armenian invariant interval, which is the geometric distance in the two dimensional space between two infinitesimal near points, which must have the same value in all systems. Therefore, if we no longer use the principle of "relativity" as a fundamental axiom, it makes no sense to call our new theory "Armenian Theory of Relativity", but it would be more natural to call it "Armenian Theory of Time-Space", which more accurately characterizes our new theory.

- In the first and second volumes of our research work, we have recognized that time and space are not isotropic, but as a principle in our first volume we have assumed that time and space are homogenous. In this third volume of our research work we also suspended the principle of homogeneity of time and space as unnecessary, because in cases of observation from inertial or non-inertial systems, we will always discuss differentials of different physical quantities and their transformation equations.

4_02

➢ *Initial state condition of systems and particles*

When $T_\lambda = T_\mu = T_\nu = T_\sigma = \ldots = 0$

Then the origins of all systems coincide with each other at 0 points in space.

4_03

Measurements of the Coefficients of Transformations

➢ *Alpha coefficients measurements*

4_04

$$\begin{cases} (\alpha^1_{\lambda\mu}, \alpha^1_{\mu\lambda}) & \rightarrow \quad \text{don't have a measurement} \\ (\alpha^2_{\lambda\mu}, \alpha^2_{\mu\lambda}) & \rightarrow \quad \text{have inverse measurement of velicity } (\frac{1}{c}) \\ (\alpha^3_{\lambda\mu}, \alpha^3_{\mu\lambda}) & \rightarrow \quad \text{have inverse measurement of acceleration } (\frac{1}{a}) \end{cases}$$

➢ *Eta coefficients measurements*

4_05

$$\begin{cases} (\eta^1_{\lambda\mu}, \eta^1_{\mu\lambda}) & \rightarrow \quad \text{have a measurement of velicity } (c) \\ (\eta^2_{\lambda\mu}, \eta^2_{\mu\lambda}) & \rightarrow \quad \text{don't have a measurement} \\ (\eta^3_{\lambda\mu}, \eta^3_{\mu\lambda}) & \rightarrow \quad \text{have a measurement of time } (t) \end{cases}$$

➢ *Beta coefficients measurements*

4_06

$$\begin{cases} (B^1_{\lambda\mu}, B^1_{\mu\lambda}) & \rightarrow \quad \text{don't have a measurement} \\ (B^2_{\lambda\mu}, B^2_{\mu\lambda}) & \rightarrow \quad \text{have inverse measurement of velicity } (\frac{1}{c}) \\ (B^3_{\lambda\mu}, B^3_{\mu\lambda}) & \rightarrow \quad \text{have inverse measurement of acceleration } (\frac{1}{a}) \end{cases}$$

➢ *Gamma coefficients measurements*

4_07

$$\begin{cases} (\Gamma^1_{\lambda\mu}, \Gamma^1_{\mu\lambda}) & \rightarrow \quad \text{have a measurement of velicity } (c) \\ (\Gamma^2_{\lambda\mu}, \Gamma^2_{\mu\lambda}) & \rightarrow \quad \text{don't have a measurement} \\ (\Gamma^3_{\lambda\mu}, \Gamma^3_{\mu\lambda}) & \rightarrow \quad \text{have a measurement of time } (t) \end{cases}$$

Two Possible Cases of Particle's Coordinates Transformation Equations Depending on That Observing Systems are Inertial or Non-Inertial

- *The first case is when the observing systems are inertial, that is, when the relative velocities are constant quantities*

$$\begin{cases} V_{\lambda\mu} = \text{constant} \\ V_{\mu\lambda} = \text{constant} \end{cases} \tag{4_08}$$

- *Consequently the differentials of relative velocities are equal to zero and therefore all third terms of the transformation equations will disappear*

$$\begin{cases} dV_{\lambda\mu} = 0 \\ dV_{\mu\lambda} = 0 \end{cases} \tag{4_09}$$

- *The second case is when the observing systems are not inertial, that is, when the relative velocities are variable quantities*

$$\begin{cases} V_{\lambda\mu} \neq \text{constant} \\ V_{\mu\lambda} \neq \text{constant} \end{cases} \tag{4_10}$$

- *Consequently, the differentials of relative velocities are not equal to zero, and therefore in the transformation equations all third terms are retained unless otherwise proved later*

$$\begin{cases} dV_{\lambda\mu} \neq 0 \\ dV_{\mu\lambda} \neq 0 \end{cases} \tag{4_11}$$

First and Second Types of Transformation Equations When Observing Systems are Inertial (The First Case)

- *In the case of first type of transformations, the direct transformation equations of reciprocal observing coordinates differentials*

4_12

$$\begin{cases} dT_{\mu\lambda} = \alpha^1_{\lambda\mu} dT_{\lambda\mu} + \alpha^2_{\lambda\mu} dX_{\lambda\mu} \\ dX_{\mu\lambda} = \eta^1_{\lambda\mu} dT_{\lambda\mu} + \eta^2_{\lambda\mu} dX_{\lambda\mu} \end{cases}$$

- *In the case of first type of transformations, the inverse transformation equations of reciprocal observing coordinates differentials*

4_13

$$\begin{cases} dT_{\lambda\mu} = \alpha^1_{\mu\lambda} dT_{\mu\lambda} + \alpha^2_{\mu\lambda} dX_{\mu\lambda} \\ dX_{\lambda\mu} = \eta^1_{\mu\lambda} dT_{\mu\lambda} + \eta^2_{\mu\lambda} dX_{\mu\lambda} \end{cases}$$

- *In the case of second type of transformations, the direct transformation equations of observed particle's coordinates differentials*

4_14

$$\begin{cases} dT_{\mu\sigma} = B^1_{\lambda\mu} dT_{\lambda\sigma} + B^2_{\lambda\mu} dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \Gamma^1_{\lambda\mu} dT_{\lambda\sigma} + \Gamma^2_{\lambda\mu} dX_{\lambda\sigma} \end{cases}$$

- *In the case of second type of transformations, the inverse transformation equations of observed particle's coordinates differentials*

4_15

$$\begin{cases} dT_{\lambda\sigma} = B^1_{\mu\lambda} dT_{\mu\sigma} + B^2_{\mu\lambda} dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \Gamma^1_{\mu\lambda} dT_{\mu\sigma} + \Gamma^2_{\mu\lambda} dX_{\mu\sigma} \end{cases}$$

First and Second Types of Transformation Equations When Observing Systems are Not Inertial (The Second Case)

- *In the case of first type of transformations, the direct transformation equations of reciprocal observing coordinates differentials*

$$\begin{cases} dT_{\mu\lambda} = (\alpha^1_{\lambda\mu} + \alpha^3_{\lambda\mu} A_{\lambda\mu}) dT_{\lambda\mu} + \alpha^2_{\lambda\mu} dX_{\lambda\mu} \\ dX_{\mu\lambda} = \left(\eta^1_{\lambda\mu} + \eta^3_{\lambda\mu} A_{\lambda\mu}\right) dT_{\lambda\mu} + \eta^2_{\lambda\mu} dX_{\lambda\mu} \end{cases}$$ 4_16

- *In the case of first type of transformations, the inverse transformation equations of reciprocal observing coordinates differentials*

$$\begin{cases} dT_{\lambda\mu} = (\alpha^1_{\mu\lambda} + \alpha^3_{\mu\lambda} A_{\mu\lambda}) dT_{\mu\lambda} + \alpha^2_{\mu\lambda} dX_{\mu\lambda} \\ dX_{\lambda\mu} = \left(\eta^1_{\mu\lambda} + \eta^3_{\mu\lambda} A_{\mu\lambda}\right) dT_{\mu\lambda} + \eta^2_{\mu\lambda} dX_{\mu\lambda} \end{cases}$$ 4_17

- *In the case of second type of transformations, the direct transformation equations of observed particle's coordinates differentials*

$$\begin{cases} dT_{\mu\sigma} = B^1_{\lambda\mu} dT_{\lambda\sigma} + B^2_{\lambda\mu} dX_{\lambda\sigma} + (B^3_{\lambda\mu} A_{\lambda\mu}) dT_{\lambda\mu} \\ dX_{\mu\sigma} = \Gamma^1_{\lambda\mu} dT_{\lambda\sigma} + \Gamma^2_{\lambda\mu} dX_{\lambda\sigma} + (\Gamma^3_{\lambda\mu} A_{\lambda\mu}) dT_{\lambda\mu} \end{cases}$$ 4_18

- *In the case of second type of transformations, the inverse transformation equations of observed particle's coordinates differentials*

$$\begin{cases} dT_{\lambda\sigma} = B^1_{\mu\lambda} dT_{\mu\sigma} + B^2_{\mu\lambda} dX_{\mu\sigma} + (B^3_{\mu\lambda} A_{\mu\lambda}) dT_{\mu\lambda} \\ dX_{\lambda\sigma} = \Gamma^1_{\mu\lambda} dT_{\mu\sigma} + \Gamma^2_{\mu\lambda} dX_{\mu\sigma} + (\Gamma^3_{\mu\lambda} A_{\mu\lambda}) dT_{\mu\lambda} \end{cases}$$ 4_19

Chapter 5

Investigation of the Second Type of General Transformation Equations When Observing Systems are Inertial (The First Case)

We start our investigation from the second type of general transformation equations. After accomplishing this task and receiving transformation equations and appropriate relativistic relations, we start investigating and solving the first type of general transformation equations in the following chapters.

Besides that, since the first and second types of transformation equations are always expressed by quantities of particle infinitesimal coordinates - by differentials of coordinates, in order to be brief, it is necessary to agree on the following. From now on, for simplicity purposes, instead of using every time, for example, the phrase "the particle coordinate differentials" - we will use the phrase "the particle infinitesimal coordinates" or more concise "the particle coordinates" and so on (if there is no need to say the full phrase). We will also use this type of simplicity in future with other infinitesimal physical quantities characterizing an observed particle's motion, such as Armenian intervals, absolute time and so on.

Second Type of General Transformation Equations

- *The condition of being the inertial observing systems (with Armenian interpretation)*

$$\begin{cases} V_{\lambda\mu} = \text{constant} \\ V_{\mu\lambda} = \text{constant} \end{cases}$$ 5_01

- *Consequently, the differentials of the relative velocities are equal to zero*

$$\begin{cases} dV_{\lambda\mu} = 0 \\ dV_{\mu\lambda} = 0 \end{cases}$$ 5_02

- *It follows from the above that, according to (4_14), the direct transformation equations of the observed particle's coordinates will be*

$$\begin{cases} dT_{\mu\sigma} = \mathcal{B}^1_{\lambda\mu} dT_{\lambda\sigma} + \mathcal{B}^2_{\lambda\mu} dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \Gamma^1_{\lambda\mu} dT_{\lambda\sigma} + \Gamma^2_{\lambda\mu} dX_{\lambda\sigma} \end{cases}$$ 5_03

- *It follows from above that, according to (4_15), the inverse transformation equations of the observed particle's coordinates will be*

$$\begin{cases} dT_{\lambda\sigma} = \mathcal{B}^1_{\mu\lambda} dT_{\mu\sigma} + \mathcal{B}^2_{\mu\lambda} dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \Gamma^1_{\mu\lambda} dT_{\mu\sigma} + \Gamma^2_{\mu\lambda} dX_{\mu\sigma} \end{cases}$$ 5_04

Particle's Velocity Transformation Relations

- *Derivatives of the particle's coordinate direct and inverse transformation equations by the reciprocal observing times*

5_05

Derivatives of direct transformation and Derivatives of inverse transformation

$$\begin{cases} \dfrac{dT_{\mu\sigma}}{dT_{\lambda\sigma}} = \mathcal{B}^1_{\lambda\mu} + \mathcal{B}^2_{\lambda\mu} U_{\lambda\sigma} \\ \dfrac{dX_{\mu\sigma}}{dT_{\lambda\sigma}} = \Gamma^1_{\lambda\mu} + \Gamma^2_{\lambda\mu} U_{\lambda\sigma} \end{cases} \quad \text{and} \quad \begin{cases} \dfrac{dT_{\lambda\sigma}}{dT_{\mu\sigma}} = \mathcal{B}^1_{\mu\lambda} + \mathcal{B}^2_{\mu\lambda} U_{\mu\sigma} \\ \dfrac{dX_{\lambda\sigma}}{dT_{\mu\sigma}} = \Gamma^1_{\mu\lambda} + \Gamma^2_{\mu\lambda} U_{\mu\sigma} \end{cases}$$

- *Relations of moving particle's observed time differentials written together*

5_06

$$\begin{cases} \dfrac{dT_{\mu\sigma}}{dT_{\lambda\sigma}} = \mathcal{B}^1_{\lambda\mu} + \mathcal{B}^2_{\lambda\mu} U_{\lambda\sigma} \\ \dfrac{dT_{\lambda\sigma}}{dT_{\mu\sigma}} = \mathcal{B}^1_{\mu\lambda} + \mathcal{B}^2_{\mu\lambda} U_{\mu\sigma} \end{cases}$$

- *Transformation relations of the moving particle's observed velocities*

5_07

$$\begin{cases} U_{\mu\sigma} = \dfrac{\Gamma^1_{\lambda\mu} + \Gamma^2_{\lambda\mu} U_{\lambda\sigma}}{\mathcal{B}^1_{\lambda\mu} + \mathcal{B}^2_{\lambda\mu} U_{\lambda\sigma}} \\ U_{\lambda\sigma} = \dfrac{\Gamma^1_{\mu\lambda} + \Gamma^2_{\mu\lambda} U_{\mu\sigma}}{\mathcal{B}^1_{\mu\lambda} + \mathcal{B}^2_{\mu\lambda} U_{\mu\sigma}} \end{cases}$$

5_08

The above mentioned transformation relations of the moving particle's observed velocities also satisfy the condition of involution.

Getting Some Important Relations

- *From the relations of the particle's observed time, we will obtain the following symmetric relation*

$$(\mathcal{B}^1_{\lambda\mu} + \mathcal{B}^2_{\lambda\mu} U_{\lambda\sigma})(\mathcal{B}^1_{\mu\lambda} + \mathcal{B}^2_{\mu\lambda} U_{\mu\sigma}) \;=\; 1$$ 5_09

- *And from the transformation relations of the particle's observed velocities, we obtain the following symmetric relation*

$$(\Gamma^1_{\lambda\mu} + \Gamma^2_{\lambda\mu} U_{\lambda\sigma})(\Gamma^1_{\mu\lambda} + \Gamma^2_{\mu\lambda} U_{\mu\sigma}) \;=\; U_{\lambda\sigma} U_{\mu\sigma}$$ 5_10

- *Into particle's observed velocity transformation relations given in (5_07), passing through to the boundary conditions when* $\sigma = \lambda$ *and* $\sigma = \mu$ *, we obtain the direct and inverse relative velocities expressed by the coefficients of reciprocal transformation*

$$\begin{cases} \sigma = \lambda \;\rightarrow\; V_{\mu\lambda} \;=\; \dfrac{\Gamma^1_{\lambda\mu}}{\mathcal{B}^1_{\lambda\mu}} \\[2ex] \sigma = \mu \;\rightarrow\; V_{\lambda\mu} \;=\; \dfrac{\Gamma^1_{\mu\lambda}}{\mathcal{B}^1_{\mu\lambda}} \end{cases}$$ 5_11

 5_12

First volume of our research work was dedicated to the
25-th Anniversary of the Independence of Armenia and Artsakh
(22 September 2016, Yerevan, Armenia)

Boundary Cases of Transformation Equations of the Second Type, when $\sigma = \mu$ and $\sigma = \lambda$

- *Direct transformation equations of observed particle's coordinate when* $\sigma = \mu$

5_13
$$\begin{cases} dT_{\mu\mu} = d\tau_{\mu} = (\mathcal{B}^{1}_{\lambda\mu} + \mathcal{B}^{2}_{\lambda\mu} V_{\lambda\mu}) dT_{\lambda\mu} \\ dX_{\mu\mu} = 0 = (\Gamma^{1}_{\lambda\mu} + \Gamma^{2}_{\lambda\mu} V_{\lambda\mu}) dT_{\lambda\mu} \end{cases}$$

- *Inverse transformation equations of observed particle's coordinate when* $\sigma = \mu$

5_14
$$\begin{cases} dT_{\lambda\mu} = \mathcal{B}^{1}_{\mu\lambda} d\tau_{\mu} \\ dX_{\lambda\mu} = V_{\lambda\mu} dT_{\lambda\mu} = \Gamma^{1}_{\mu\lambda} d\tau_{\mu} \end{cases}$$

- *Direct transformation equations of observed particle's coordinate when* $\sigma = \lambda$

5_15
$$\begin{cases} dT_{\mu\lambda} = \mathcal{B}^{1}_{\lambda\mu} d\tau_{\lambda} \\ dX_{\mu\lambda} = V_{\mu\lambda} dT_{\mu\lambda} = \Gamma^{1}_{\lambda\mu} d\tau_{\lambda} \end{cases}$$

- *Inverse transformation equations of observed particle's coordinate when* $\sigma = \lambda$

5_16
$$\begin{cases} dT_{\lambda\lambda} = d\tau_{\lambda} = (\mathcal{B}^{1}_{\mu\lambda} + \mathcal{B}^{2}_{\mu\lambda} V_{\mu\lambda}) dT_{\mu\lambda} \\ dX_{\lambda\lambda} = 0 = (\Gamma^{1}_{\mu\lambda} + \Gamma^{2}_{\mu\lambda} V_{\mu\lambda}) dT_{\mu\lambda} \end{cases}$$

Important Relations of the Second Type of General Transformations Written Together

- *The most important and basic relations between gamma coefficients*

$$\begin{cases} \Gamma^1_{\lambda\mu} + \Gamma^2_{\lambda\mu} V_{\lambda\mu} = 0 \\ \Gamma^1_{\mu\lambda} + \Gamma^2_{\mu\lambda} V_{\mu\lambda} = 0 \end{cases} \qquad 5\_17$$

- *The first set of relations between the observing systems' own time and the reciprocal observed time*

$$\begin{cases} d\tau_\lambda = (\mathcal{B}^1_{\mu\lambda} + \mathcal{B}^2_{\mu\lambda} V_{\mu\lambda}) dT_{\mu\lambda} \\ d\tau_\mu = (\mathcal{B}^1_{\lambda\mu} + \mathcal{B}^2_{\lambda\mu} V_{\lambda\mu}) dT_{\lambda\mu} \end{cases} \qquad 5\_18$$

- *The second set of relations between the observing systems' own time and the reciprocal observed time*

$$\begin{cases} dT_{\mu\lambda} = \mathcal{B}^1_{\lambda\mu} d\tau_\lambda \\ dT_{\lambda\mu} = \mathcal{B}^1_{\mu\lambda} d\tau_\mu \end{cases} \quad \text{and} \quad \begin{cases} V_{\lambda\mu} dT_{\lambda\mu} = \Gamma^1_{\mu\lambda} d\tau_\mu \\ V_{\mu\lambda} dT_{\mu\lambda} = \Gamma^1_{\lambda\mu} d\tau_\lambda \end{cases} \qquad 5\_19$$

- *In the left side of the above relations, inserting systems own time expressions (5_18), we obtain beta1 coefficients expressed with reciprocal coefficients*

$$\begin{cases} \mathcal{B}^1_{\lambda\mu} = \dfrac{1}{\mathcal{B}^1_{\mu\lambda} + \mathcal{B}^2_{\mu\lambda} V_{\mu\lambda}} \\ \mathcal{B}^1_{\mu\lambda} = \dfrac{1}{\mathcal{B}^1_{\lambda\mu} + \mathcal{B}^2_{\lambda\mu} V_{\lambda\mu}} \end{cases} \qquad 5\_20$$

Chapter 6

Solution to the Second Type of General Transformation Equations

To solve General transformation equations of the second type, we can use the methods of reciprocal substitutions or reciprocal solutions. But since in the two preceding volumes we have preferred and successfully used the method of reciprocal solutions, so we will use it here as well.

Representation of General Transformation Equations of the Second Type in the Form of System of Linear Equations

- *Initial form of direct transformation equations of coordinates of the observed particle σ*

$$\begin{cases} dT_{\mu\sigma} = \mathcal{B}^1_{\lambda\mu} dT_{\lambda\sigma} + \mathcal{B}^2_{\lambda\mu} dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \Gamma^1_{\lambda\mu} dT_{\lambda\sigma} + \Gamma^2_{\lambda\mu} dX_{\lambda\sigma} \end{cases} \tag{6\_01}$$

- *Initial form of inverse transformation equations of coordinates of the observed particle σ*

$$\begin{cases} dT_{\lambda\sigma} = \mathcal{B}^1_{\mu\lambda} dT_{\mu\sigma} + \mathcal{B}^2_{\mu\lambda} dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \Gamma^1_{\mu\lambda} dT_{\mu\sigma} + \Gamma^2_{\mu\lambda} dX_{\mu\sigma} \end{cases} \tag{6\_02}$$

- *Direct transformation equations of coordinates of the observed particle written in the form of the system of linear equations*

$$\begin{cases} \mathcal{B}^1_{\lambda\mu} dT_{\lambda\sigma} + \mathcal{B}^2_{\lambda\mu} dX_{\lambda\sigma} = dT_{\mu\sigma} \\ \Gamma^1_{\lambda\mu} dT_{\lambda\sigma} + \Gamma^2_{\lambda\mu} dX_{\lambda\sigma} = dX_{\mu\sigma} \end{cases} \tag{6\_03}$$

- *Inverse transformation equations of coordinates of the observed particle written in the form of the system of linear equations*

$$\begin{cases} \mathcal{B}^1_{\mu\lambda} dT_{\mu\sigma} + \mathcal{B}^2_{\mu\lambda} dX_{\mu\sigma} = dT_{\lambda\sigma} \\ \Gamma^1_{\mu\lambda} dT_{\mu\sigma} + \Gamma^2_{\mu\lambda} dX_{\mu\sigma} = dX_{\lambda\sigma} \end{cases} \tag{6\_04}$$

Notations and Formulas of the System Determinants and the New General Transformation Equations

➢ *Notations of determinants for system of transformation equations of coordinates of the observed particle* σ

6_05

$$\begin{cases} D^2_{\lambda\mu} = \begin{vmatrix} \mathcal{B}^1_{\lambda\mu} & \mathcal{B}^2_{\lambda\mu} \\ \Gamma^1_{\lambda\mu} & \Gamma^2_{\lambda\mu} \end{vmatrix} \\ D^2_{\mu\lambda} = \begin{vmatrix} \mathcal{B}^1_{\mu\lambda} & \mathcal{B}^2_{\mu\lambda} \\ \Gamma^1_{\mu\lambda} & \Gamma^2_{\mu\lambda} \end{vmatrix} \end{cases}$$

➢ *Formulas of determinants for system of transformation equations of coordinates of the observed particle* σ

6_06

$$\begin{cases} D^2_{\lambda\mu} = \mathcal{B}^1_{\lambda\mu}\Gamma^2_{\lambda\mu} - \mathcal{B}^2_{\lambda\mu}\Gamma^1_{\lambda\mu} \neq 0 \\ D^2_{\mu\lambda} = \mathcal{B}^1_{\mu\lambda}\Gamma^2_{\mu\lambda} - \mathcal{B}^2_{\mu\lambda}\Gamma^1_{\mu\lambda} \neq 0 \end{cases}$$

➢ *By solving the systems of transformation equations given in (6_03) and (6_04), from the point of view of observing inertial systems* μ *and* λ*, we obtain new transformation equations for the coordinates of the observed particle* σ

6_07

From the point of view of the observing system K_μ

$$\begin{cases} dT_{\mu\sigma} = \dfrac{1}{D^2_{\mu\lambda}} \begin{vmatrix} dT_{\lambda\sigma} & \mathcal{B}^2_{\mu\lambda} \\ dX_{\lambda\sigma} & \Gamma^2_{\mu\lambda} \end{vmatrix} \\ dX_{\mu\sigma} = \dfrac{1}{D^2_{\mu\lambda}} \begin{vmatrix} \mathcal{B}^1_{\mu\lambda} & dT_{\lambda\sigma} \\ \Gamma^1_{\mu\lambda} & dX_{\lambda\sigma} \end{vmatrix} \end{cases}$$

and

From the point of view of the observing system K_λ

$$\begin{cases} dT_{\lambda\sigma} = \dfrac{1}{D^2_{\lambda\mu}} \begin{vmatrix} dT_{\mu\sigma} & \mathcal{B}^2_{\lambda\mu} \\ dX_{\mu\sigma} & \Gamma^2_{\lambda\mu} \end{vmatrix} \\ dX_{\lambda\sigma} = \dfrac{1}{D^2_{\lambda\mu}} \begin{vmatrix} \mathcal{B}^1_{\lambda\mu} & dT_{\mu\sigma} \\ \Gamma^1_{\lambda\mu} & dX_{\mu\sigma} \end{vmatrix} \end{cases}$$

Newly Derived General Transformation Equations and Relations Between Transformation Coefficients

- *Newly derived transformation equations of the observed particle coordinates given in (6_07) and written in the legacy form (in the second equations the spatial coordinates written first)*

$$\begin{cases} dT_{\mu\sigma} = \dfrac{\Gamma^2_{\mu\lambda}}{D^2_{\mu\lambda}} dT_{\lambda\sigma} - \dfrac{B^2_{\mu\lambda}}{D^2_{\mu\lambda}} dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \dfrac{B^1_{\mu\lambda}}{D^2_{\mu\lambda}} dX_{\lambda\sigma} - \dfrac{\Gamma^1_{\mu\lambda}}{D^2_{\mu\lambda}} dT_{\lambda\sigma} \end{cases} \text{ and } \begin{cases} dT_{\lambda\sigma} = \dfrac{\Gamma^2_{\lambda\mu}}{D^2_{\lambda\mu}} dT_{\mu\sigma} - \dfrac{B^2_{\lambda\mu}}{D^2_{\lambda\mu}} dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \dfrac{B^1_{\lambda\mu}}{D^2_{\lambda\mu}} dX_{\mu\sigma} - \dfrac{\Gamma^1_{\lambda\mu}}{D^2_{\lambda\mu}} dT_{\mu\sigma} \end{cases} \quad (6\_08)$$

- *The above newly derived transformation equations of the observed particle coordinates written in the natural form (in all equations time coordinates written first)*

$$\begin{cases} dT_{\mu\sigma} = \dfrac{\Gamma^2_{\mu\lambda}}{D^2_{\mu\lambda}} dT_{\lambda\sigma} - \dfrac{B^2_{\mu\lambda}}{D^2_{\mu\lambda}} dX_{\lambda\sigma} \\ dX_{\mu\sigma} = -\dfrac{\Gamma^1_{\mu\lambda}}{D^2_{\mu\lambda}} dT_{\lambda\sigma} + \dfrac{B^1_{\mu\lambda}}{D^2_{\mu\lambda}} dX_{\lambda\sigma} \end{cases} \text{ and } \begin{cases} dT_{\lambda\sigma} = \dfrac{\Gamma^2_{\lambda\mu}}{D^2_{\lambda\mu}} dT_{\mu\sigma} - \dfrac{B^2_{\lambda\mu}}{D^2_{\lambda\mu}} dX_{\mu\sigma} \\ dX_{\lambda\sigma} = -\dfrac{\Gamma^1_{\lambda\mu}}{D^2_{\lambda\mu}} dT_{\mu\sigma} + \dfrac{B^1_{\lambda\mu}}{D^2_{\lambda\mu}} dX_{\mu\sigma} \end{cases} \quad (6\_09)$$

- *Comparing the newly derived direct transformation equations given in (6_09) to the initial form of transformation equations given in (6_01) we will get the following relations between coefficients*

$$\begin{cases} B^1_{\lambda\mu} = + \dfrac{1}{D^2_{\mu\lambda}} \Gamma^2_{\mu\lambda} \\ B^2_{\lambda\mu} = - \dfrac{1}{D^2_{\mu\lambda}} B^2_{\mu\lambda} \end{cases} \text{ and } \begin{cases} \Gamma^1_{\lambda\mu} = - \dfrac{1}{D^2_{\mu\lambda}} \Gamma^1_{\mu\lambda} \\ \Gamma^2_{\lambda\mu} = + \dfrac{1}{D^2_{\mu\lambda}} B^1_{\mu\lambda} \end{cases} \quad (6\_10)$$

- *Comparing the newly derived inverse transformation equations given in (6_09) to the initial form of transformation equations given in (6_02) we will get the following relations between coefficients*

$$\begin{cases} B^1_{\mu\lambda} = + \dfrac{1}{D^2_{\lambda\mu}} \Gamma^2_{\lambda\mu} \\ B^2_{\mu\lambda} = - \dfrac{1}{D^2_{\lambda\mu}} B^2_{\lambda\mu} \end{cases} \text{ and } \begin{cases} \Gamma^1_{\mu\lambda} = - \dfrac{1}{D^2_{\lambda\mu}} \Gamma^1_{\lambda\mu} \\ \Gamma^2_{\mu\lambda} = + \dfrac{1}{D^2_{\lambda\mu}} B^1_{\lambda\mu} \end{cases} \quad (6\_11)$$

From Comparison Coefficients of Transformations we Will get the Following Important Relations

- *The inverse relation between determinants of transformation equations*

6_12

$$\boxed{D^2_{\lambda\mu} D^2_{\mu\lambda} = 1}$$

- *The most important relation of beta1 coefficients*

6_13

$$\boxed{\mathcal{B}^1_{\lambda\mu} \mathcal{B}^1_{\mu\lambda} = \Gamma^2_{\lambda\mu} \Gamma^2_{\mu\lambda}}$$

- *Definition of the first invariant relation*

6_14

$$\boxed{\frac{\mathcal{B}^2_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = \frac{\mathcal{B}^2_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = \zeta_1}$$

- *Definition of the second invariant relation*

6_15

$$\boxed{\frac{\Gamma^2_{\lambda\mu} - \mathcal{B}^1_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = \frac{\Gamma^2_{\mu\lambda} - \mathcal{B}^1_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = \zeta_2}$$

Representation of the First and Second Invariant Relations by Coefficients That do not Have Measurement

- *Using the measurements of beta2 and gamma1 coefficients, the first invariant relation given in (6_14) can be written with a non-measurable new function g, which may depend on many variables*

$$\begin{cases} \dfrac{\mathcal{B}^2_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = \zeta_1(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) = -\dfrac{1}{c^2} g(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) \\ \dfrac{\mathcal{B}^2_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = \zeta_1(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) = -\dfrac{1}{c^2} g(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) \end{cases} \qquad \text{6\_16}$$

- *Therefore the new function g and the first invariant relation can be written briefly as follows*

$$\begin{cases} g(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) := g_{\lambda\mu} \\ g(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) := g_{\mu\lambda} \end{cases} \Rightarrow \begin{cases} \dfrac{\mathcal{B}^2_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = -\dfrac{1}{c^2} g_{\lambda\mu} \\ \dfrac{\mathcal{B}^2_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = -\dfrac{1}{c^2} g_{\mu\lambda} \end{cases} \qquad \text{6\_17}$$

- *Also keeping in mind the measurements of beta1, gamma1 and gamma2 coefficients, the second invariant relation given in (6_15) can be written with a non-measurable new function s, which may depend on many variables*

$$\begin{cases} \dfrac{\Gamma^2_{\lambda\mu} - \mathcal{B}^1_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = \zeta_2(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) = \dfrac{1}{c} s(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) \\ \dfrac{\Gamma^2_{\mu\lambda} - \mathcal{B}^1_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = \zeta_2(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) = \dfrac{1}{c} s(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) \end{cases} \qquad \text{6\_18}$$

- *Therefore the new function s and the second invariant relation can be written briefly as follows*

$$\begin{cases} s(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) := s_{\lambda\mu} \\ s(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) := s_{\mu\lambda} \end{cases} \Rightarrow \begin{cases} \dfrac{\Gamma^2_{\lambda\mu} - \mathcal{B}^1_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = \dfrac{1}{c} s_{\lambda\mu} \\ \dfrac{\Gamma^2_{\mu\lambda} - \mathcal{B}^1_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = \dfrac{1}{c} s_{\mu\lambda} \end{cases} \qquad \text{6\_19}$$

Chapter 7

Definition of Constant Quantities and Expressions of Transformation Coefficients

In this chapter, we show that the two variable coefficients s and g introduced in the previous chapter, for the given two observing inertial systems, are constant quantities, but may have different values for the different pair of observing inertial systems. But in Appendix_1 of this third volume, we will show that these coefficients are actually universal constant quantities and they do not depend on the choice of observing systems.

Investigation of the First Invariant Relation and Definition of the Constant Quantity g

- *According to the definition of the first invariant relation given in (6_14), the g variable function given in (6_16) must satisfy the following functional equation*

$$g_{\lambda\mu} = g(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) = g(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) = g_{\mu\lambda} \qquad \text{7\_01}$$

- *The most general solution of the above functional equation will be the constant value, which we will define as the first constant quantity and denote it by the letter g*

$$g_{\lambda\mu} = g_{\mu\lambda} := g = \text{invariant constant} \qquad \text{7\_02}$$

- *The relations of the beta2 and gamma1 coefficients given in (6_14) can be expressed by the newly defined g constant quantity as follows*

$$\begin{cases} \dfrac{\mathcal{B}^2_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = -\,g\dfrac{1}{c^2} \\ \dfrac{\mathcal{B}^2_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = -\,g\dfrac{1}{c^2} \end{cases} \qquad \text{7\_03}$$

- *Therefore there will be the following relations between the beta2 and gamma1 coefficients*

$$\begin{cases} c\mathcal{B}^2_{\lambda\mu} = -\,g\left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right) \\ c\mathcal{B}^2_{\mu\lambda} = -\,g\left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right) \end{cases} \qquad \text{7\_04}$$

Investigation of the Second Invariant Relation and Definition of the Constant Quantity s

- *According to the definition of the second invariant relation given in (6_15), the s variable function given in (6_18) must satisfy the following functional equation*

7_05

$$s_{\lambda\mu} = s(T_{\lambda\sigma}, X_{\lambda\sigma}, V_{\lambda\mu}, \dots) = s(T_{\mu\sigma}, X_{\mu\sigma}, V_{\mu\lambda}, \dots) = s_{\mu\lambda}$$

- *The most general solution of the above functional equation will be the constant value, which we will define as the second constant quantity and denote it by the letter s*

7_06

$$s_{\lambda\mu} = s_{\mu\lambda} := s = \text{invariant constant}$$

- *The relations of the beta1, gamma1 and gamma2 coefficients given in (6_15) can be expressed by the newly defined s constant quantity as follows*

7_07

$$\begin{cases} \dfrac{\Gamma^2_{\lambda\mu} - \mathcal{B}^1_{\lambda\mu}}{\Gamma^1_{\lambda\mu}} = s\dfrac{1}{c} \\[2ex] \dfrac{\Gamma^2_{\mu\lambda} - \mathcal{B}^1_{\mu\lambda}}{\Gamma^1_{\mu\lambda}} = s\dfrac{1}{c} \end{cases}$$

- *Therefore there will be the following relations between the beta1, gamma1 and gamma2 coefficients*

7_08

$$\begin{cases} \mathcal{B}^1_{\lambda\mu} = \Gamma^2_{\lambda\mu} - s\dfrac{1}{c}\Gamma^1_{\lambda\mu} \\ \mathcal{B}^1_{\mu\lambda} = \Gamma^2_{\mu\lambda} - s\dfrac{1}{c}\Gamma^1_{\mu\lambda} \end{cases} \Rightarrow \begin{cases} \Gamma^2_{\lambda\mu} = \mathcal{B}^1_{\lambda\mu} + s\dfrac{1}{c}\Gamma^1_{\lambda\mu} \\ \Gamma^2_{\mu\lambda} = \mathcal{B}^1_{\mu\lambda} + s\dfrac{1}{c}\Gamma^1_{\mu\lambda} \end{cases}$$

Second Type of Transformation Coefficients Expressed by the Constant Quantities s and g

➢ *Using the most important relations (5_17), the gamma1 coefficients we can write as follows*

$$\begin{cases} \dfrac{1}{c}\Gamma^1_{\lambda\mu} = -\dfrac{V_{\lambda\mu}}{c}\Gamma^2_{\lambda\mu} \\ \dfrac{1}{c}\Gamma^1_{\mu\lambda} = -\dfrac{V_{\mu\lambda}}{c}\Gamma^2_{\mu\lambda} \end{cases} \quad 7\_09$$

➢ *By inserting the above expressions of gamma1 coefficients into (7_08), we can express the beta1 coefficients with gamma2 coefficients as follows*

$$\begin{cases} B^1_{\lambda\mu} = \left(1 + s\dfrac{V_{\lambda\mu}}{c}\right)\Gamma^2_{\lambda\mu} \\ B^1_{\mu\lambda} = \left(1 + s\dfrac{V_{\mu\lambda}}{c}\right)\Gamma^2_{\mu\lambda} \end{cases} \quad 7\_10$$

➢ *Using the most significant relation of beta1 coefficients given in (6_13) and the above expressions of beta1 coefficients, for relative velocities we will obtain the following symmetric Armenian relation*

$$\left(1 + s\frac{V_{\lambda\mu}}{c}\right)\left(1 + s\frac{V_{\mu\lambda}}{c}\right) = 1 \quad 7\_11$$

➢ *By inserting in (7_04) the expressions of gamma1 coefficients given in (7_09), the beta2 coefficients can be expressed also by the gamma2 coefficients as follows*

$$\begin{cases} cB^2_{\lambda\mu} = \left(g\dfrac{V_{\lambda\mu}}{c}\right)\Gamma^2_{\lambda\mu} \\ cB^2_{\mu\lambda} = \left(g\dfrac{V_{\mu\lambda}}{c}\right)\Gamma^2_{\mu\lambda} \end{cases} \quad 7\_12$$

New Modified Forms of the Previous Obtained Expressions

➤ *The relations given in (7_04) can be written as follows*

7_13
$$\begin{cases} g\left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right) = -c\mathcal{B}^2_{\lambda\mu} \\ g\left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right) = -c\mathcal{B}^2_{\mu\lambda} \end{cases}$$

➤ *By multiplying the two sides of the relations given in (7_08) with the coefficient g and then applying the above expressions, we will obtain*

7_14
$$\begin{cases} g\mathcal{B}^1_{\lambda\mu} = g\Gamma^2_{\lambda\mu} + s(c\mathcal{B}^2_{\lambda\mu}) \\ g\mathcal{B}^1_{\mu\lambda} = g\Gamma^2_{\mu\lambda} + s(c\mathcal{B}^2_{\mu\lambda}) \end{cases} \Rightarrow \begin{cases} g\Gamma^2_{\lambda\mu} = g\mathcal{B}^1_{\lambda\mu} - s(c\mathcal{B}^2_{\lambda\mu}) \\ g\Gamma^2_{\mu\lambda} = g\mathcal{B}^1_{\mu\lambda} - s(c\mathcal{B}^2_{\mu\lambda}) \end{cases}$$

➤ *Let us write the formulas of the transformation determinants given in (6_06) in a new way*

7_15
$$\begin{cases} D^2_{\lambda\mu} = \mathcal{B}^1_{\lambda\mu}\Gamma^2_{\lambda\mu} - (c\mathcal{B}^2_{\lambda\mu})\left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right) \\ D^2_{\mu\lambda} = \mathcal{B}^1_{\mu\lambda}\Gamma^2_{\mu\lambda} - (c\mathcal{B}^2_{\mu\lambda})\left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right) \end{cases}$$

➤ *By multiplying the above form of the determinants by the coefficient g and then applying them (7_13), we will obtain it in a new form*

7_16
$$\begin{cases} gD^2_{\lambda\mu} = g\mathcal{B}^1_{\lambda\mu}\Gamma^2_{\lambda\mu} + (c\mathcal{B}^2_{\lambda\mu})^2 \\ gD^2_{\mu\lambda} = g\mathcal{B}^1_{\mu\lambda}\Gamma^2_{\mu\lambda} + (c\mathcal{B}^2_{\mu\lambda})^2 \end{cases}$$

Second Type of Transformation Determinants Expressed With Constant Quantities s and g

- *The second type of transformation determinants expressed with coefficients beta1 and gamma1*

$$\begin{cases} D_{\lambda\mu}^{2} = (\mathcal{B}_{\lambda\mu}^{1})^{2} + s\mathcal{B}_{\lambda\mu}^{1}\left(\frac{1}{c}\Gamma_{\lambda\mu}^{1}\right) + g\left(\frac{1}{c}\Gamma_{\lambda\mu}^{1}\right)^{2} \\ D_{\mu\lambda}^{2} = (\mathcal{B}_{\mu\lambda}^{1})^{2} + s\mathcal{B}_{\mu\lambda}^{1}\left(\frac{1}{c}\Gamma_{\mu\lambda}^{1}\right) + g\left(\frac{1}{c}\Gamma_{\mu\lambda}^{1}\right)^{2} \end{cases}$$ 7_17

- *The second type of transformation determinants expressed with coefficients gamma1 and gamma2*

$$\begin{cases} D_{\lambda\mu}^{2} = (\Gamma_{\lambda\mu}^{2})^{2} - s\Gamma_{\lambda\mu}^{2}\left(\frac{1}{c}\Gamma_{\lambda\mu}^{1}\right) + g\left(\frac{1}{c}\Gamma_{\lambda\mu}^{1}\right)^{2} \\ D_{\mu\lambda}^{2} = (\Gamma_{\mu\lambda}^{2})^{2} - s\Gamma_{\mu\lambda}^{2}\left(\frac{1}{c}\Gamma_{\mu\lambda}^{1}\right) + g\left(\frac{1}{c}\Gamma_{\mu\lambda}^{1}\right)^{2} \end{cases}$$ 7_18

- *The second type of transformation determinants expressed with coefficients beta2 and gamma2*

$$\begin{cases} gD_{\lambda\mu}^{2} = (c\mathcal{B}_{\lambda\mu}^{2})^{2} + s(c\mathcal{B}_{\lambda\mu}^{2})\Gamma_{\lambda\mu}^{2} + g(\Gamma_{\lambda\mu}^{2})^{2} \\ gD_{\mu\lambda}^{2} = (c\mathcal{B}_{\mu\lambda}^{2})^{2} + s(c\mathcal{B}_{\mu\lambda}^{2})\Gamma_{\mu\lambda}^{2} + g(\Gamma_{\mu\lambda}^{2})^{2} \end{cases}$$ 7_19

- *The second type of transformation determinants expressed with coefficients beta1 and beta2*

$$\begin{cases} gD_{\lambda\mu}^{2} = (c\mathcal{B}_{\lambda\mu}^{2})^{2} - s(c\mathcal{B}_{\lambda\mu}^{2})\mathcal{B}_{\lambda\mu}^{1} + g(\mathcal{B}_{\lambda\mu}^{1})^{2} \\ gD_{\mu\lambda}^{2} = (c\mathcal{B}_{\mu\lambda}^{2})^{2} - s(c\mathcal{B}_{\mu\lambda}^{2})\mathcal{B}_{\mu\lambda}^{1} + g(\mathcal{B}_{\mu\lambda}^{1})^{2} \end{cases}$$ 7_20

Other Important Relations and Expressions of Gamma2 Coefficients

- *The second type of transformation determinants expressed with all coefficients of transformation*

7_21

$$\begin{cases} \frac{1}{2}sD^2_{\lambda\mu} = \mathcal{B}^1_{\lambda\mu}\left(c\mathcal{B}^2_{\lambda\mu} + \frac{1}{2}s\Gamma^2_{\lambda\mu}\right) + \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)\left(\frac{1}{2}sc\mathcal{B}^2_{\lambda\mu} + g\Gamma^2_{\lambda\mu}\right) \\ \frac{1}{2}sD^2_{\mu\lambda} = \mathcal{B}^1_{\mu\lambda}\left(c\mathcal{B}^2_{\mu\lambda} + \frac{1}{2}s\Gamma^2_{\mu\lambda}\right) + \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)\left(\frac{1}{2}sc\mathcal{B}^2_{\mu\lambda} + g\Gamma^2_{\mu\lambda}\right) \end{cases}$$

- *Into the expression of the second type of transformation determinants given in (7_18), inserting the expressions of gamma1 coefficients from (7_09), for the transformation determinants we will obtain the following expressions*

7_22

$$\begin{cases} D^2_{\lambda\mu} = \left(1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V^2_{\lambda\mu}}{c^2}\right)\left(\Gamma^2_{\lambda\mu}\right)^2 \\ D^2_{\mu\lambda} = \left(1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V^2_{\mu\lambda}}{c^2}\right)\left(\Gamma^2_{\mu\lambda}\right)^2 \end{cases}$$

- *From the above relations, the gamma2 coefficients can be expressed by the second type of transformation determinants as follows*

7_23

$$\begin{cases} \Gamma^2_{\lambda\mu} = \sqrt{\dfrac{D^2_{\lambda\mu}}{1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V^2_{\lambda\mu}}{c^2}}} \\ \Gamma^2_{\mu\lambda} = \sqrt{\dfrac{D^2_{\mu\lambda}}{1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V^2_{\mu\lambda}}{c^2}}} \end{cases}$$

Chapter 8

Armenian Transformation Equations of Particle's Coordinates and Armenian Relations Between Different Physical Quantities

In this chapter, putting into the direct and inverse transformation equations of the particle's coordinates, the expressions of the transformation coefficients obtained in the previous chapter, we will get the final look of the Armenian transformation equations, only with the exception that we still have to determine the expressions of the gamma2 coefficients. From the Armenian transformations equations of the particle's coordinates, we will get the Armenian transformation relations of the particle velocities and then we will obtain relative velocities reciprocal relations.

Armenian General Transformation Equations of Observed Particle's Infinitesimal Coordinates

➤ *Armenian direct transformation equations of observed particle's coordinates given in (5_03) and written with measurement of length*

8_01

$$\begin{cases} cdT_{\mu\sigma} = \mathcal{B}^{1}_{\lambda\mu}(cdT_{\lambda\sigma}) + (c\mathcal{B}^{2}_{\lambda\mu})dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \left(\frac{1}{c}\Gamma^{1}_{\lambda\mu}\right)(cdT_{\lambda\sigma}) + \Gamma^{2}_{\lambda\mu}dX_{\lambda\sigma} \end{cases}$$

➤ *Armenian inverse transformation equations of observed particle's coordinates given in (5_04) and written with measurement of length*

8_02

$$\begin{cases} cdT_{\lambda\sigma} = \mathcal{B}^{1}_{\mu\lambda}(cdT_{\mu\sigma}) + (c\mathcal{B}^{2}_{\mu\lambda})dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \left(\frac{1}{c}\Gamma^{1}_{\mu\lambda}\right)(cdT_{\mu\sigma}) + \Gamma^{2}_{\mu\lambda}dX_{\mu\sigma} \end{cases}$$

➤ *Inserting the corresponding expressions of transformation coefficients from(7_09,10,12) into the direct transformation equations given in (8_01), we will get the Armenian direct transformation equations*

8_03

$$\begin{cases} cdT_{\mu\sigma} = \left[\left(1 + s\frac{V_{\lambda\mu}}{c}\right)(cdT_{\lambda\sigma}) + g\frac{V_{\lambda\mu}}{c}dX_{\lambda\sigma}\right]\Gamma^{2}_{\lambda\mu} \\ dX_{\mu\sigma} = \left[dX_{\lambda\sigma} - \frac{V_{\lambda\mu}}{c}(cdT_{\lambda\sigma})\right]\Gamma^{2}_{\lambda\mu} \end{cases}$$

➤ *Inserting the corresponding expressions of transformation coefficients from(7_09,10,12) into the inverse transformation equations given in (8_02), we will get the Armenian inverse transformation equations*

8_04

$$\begin{cases} cdT_{\lambda\sigma} = \left[\left(1 + s\frac{V_{\mu\lambda}}{c}\right)(cdT_{\mu\sigma}) + g\frac{V_{\mu\lambda}}{c}dX_{\mu\sigma}\right]\Gamma^{2}_{\mu\lambda} \\ dX_{\lambda\sigma} = \left[dX_{\mu\sigma} - \frac{V_{\mu\lambda}}{c}(cdT_{\mu\sigma})\right]\Gamma^{2}_{\mu\lambda} \end{cases}$$

Armenian Transformation Relations of the Observed Particle Velocities

- *By placing the beta1 and beta2 coefficients from (7_10,12) into the particle's observed time relations (5_06), we obtain the Armenian relations between particle's observed times*

$$\begin{cases} \dfrac{dT_{\lambda\sigma}}{dT_{\mu\sigma}} = \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)\Gamma^2_{\mu\lambda} \\ \dfrac{dT_{\mu\sigma}}{dT_{\lambda\sigma}} = \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)\Gamma^2_{\lambda\mu} \end{cases}$$

8_05

- *By placing the coefficients from (7_09,10,12) into particle velocities transformation relations given in (5_07), we will obtain Armenian transformation relations of particle velocities*

$$\begin{cases} \dfrac{U_{\lambda\sigma}}{c} = \dfrac{\dfrac{U_{\mu\sigma}}{c} - \dfrac{V_{\mu\lambda}}{c}}{1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}} \\ \dfrac{U_{\mu\sigma}}{c} = \dfrac{\dfrac{U_{\lambda\sigma}}{c} - \dfrac{V_{\lambda\mu}}{c}}{1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}} \end{cases}$$

8_06

- *From the above Armenian transformation relations of particle velocities, we can determine the reciprocal relative velocities expressed particle's observed velocities*

$$\begin{cases} \dfrac{V_{\lambda\mu}}{c} = \dfrac{\dfrac{U_{\lambda\sigma}}{c} - \dfrac{U_{\mu\sigma}}{c}}{1 + s\dfrac{U_{\mu\sigma}}{c} + g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}} \\ \dfrac{V_{\mu\lambda}}{c} = \dfrac{\dfrac{U_{\mu\sigma}}{c} - \dfrac{U_{\lambda\sigma}}{c}}{1 + s\dfrac{U_{\lambda\sigma}}{c} + g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}} \end{cases}$$

8_07

Armenian Transformation Relations of Relative Velocities

- *Putting the expressions of the gamma1 and beta1 coefficients from (7_09,10) into the formulas of relative velocities given in the (5_11), we will obtain the Armenian transformation relations between reciprocal relative velocities*

8_08

$$\boxed{\begin{cases} \dfrac{V_{\lambda\mu}}{c} = -\dfrac{\dfrac{V_{\mu\lambda}}{c}}{1 + s\dfrac{V_{\mu\lambda}}{c}} \\[2ex] \dfrac{V_{\mu\lambda}}{c} = -\dfrac{\dfrac{V_{\lambda\mu}}{c}}{1 + s\dfrac{V_{\lambda\mu}}{c}} \end{cases}}$$

- *From the above Armenian transformation relations of the reciprocal relative velocities we will obtain the Armenian symmetric relation of relative velocities already given in (7_11)*

8_09

$$\boxed{\left(1 + s\frac{V_{\lambda\mu}}{c}\right)\left(1 + s\frac{V_{\mu\lambda}}{c}\right) = 1}$$

8_10

It can be easily shown that the Armenian transformation relations between reciprocal relative velocities given in (8_08) satisfy the involution property. Then, using the Armenian symmetric relation between the relative velocities given in (8_09), it can also be shown that the Armenian transformation relations of particle velocities given in (8_06) also satisfy the involution property.

Armenian Transformation Relations of Velocities Between Reciprocal Observing Pair of Inertial Systems (λ,σ) and (μ, σ)

➢ *Armenian transformation relations of direct and reflected velocities between reciprocal observing inertial systems* λ *and* σ

$$\begin{cases} \dfrac{U_{\sigma\lambda}}{c} = -\dfrac{\dfrac{U_{\lambda\sigma}}{c}}{1+s\dfrac{U_{\lambda\sigma}}{c}} \\[2ex] \dfrac{U_{\lambda\sigma}}{c} = -\dfrac{\dfrac{U_{\sigma\lambda}}{c}}{1+s\dfrac{U_{\sigma\lambda}}{c}} \end{cases} \qquad 8\_11$$

➢ *Armenian transformation relations of direct and reflected velocities between reciprocal observing inertial systems* μ *and* σ

$$\begin{cases} \dfrac{U_{\sigma\mu}}{c} = -\dfrac{\dfrac{U_{\mu\sigma}}{c}}{1+s\dfrac{U_{\mu\sigma}}{c}} \\[2ex] \dfrac{U_{\mu\sigma}}{c} = -\dfrac{\dfrac{U_{\sigma\mu}}{c}}{1+s\dfrac{U_{\sigma\mu}}{c}} \end{cases} \qquad 8\_12$$

➢ *From the above Armenian transformation relations of reciprocal velocities, we will get the corresponding Armenian symmetric relations between them*

$$\begin{cases} \left(1+s\dfrac{U_{\lambda\sigma}}{c}\right)\left(1+s\dfrac{U_{\sigma\lambda}}{c}\right) = 1 \\[2ex] \left(1+s\dfrac{U_{\mu\sigma}}{c}\right)\left(1+s\dfrac{U_{\sigma\mu}}{c}\right) = 1 \end{cases} \qquad 8\_13$$

Displaying Additional Relations Between Velocities

- By placing the beta1 and beta2 coefficients expressions from (7_10,12) into the symmetric expression (5_09), we obtain the following relation

8_14
$$\left(1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)\left(1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right) = \frac{1}{\Gamma^2_{\lambda\mu}\Gamma^2_{\mu\lambda}}$$

- Inserting the expressions of gamma1 coefficients expressions from (7_09) into the relation given in (5_10), we obtain the following relation

8_15
$$\left(\frac{U_{\lambda\sigma}}{c} - \frac{V_{\lambda\mu}}{c}\right)\left(\frac{U_{\mu\sigma}}{c} - \frac{V_{\mu\lambda}}{c}\right)\Gamma^2_{\lambda\mu}\Gamma^2_{\mu\lambda} = \frac{U_{\lambda\sigma}}{c}\frac{U_{\mu\sigma}}{c}$$

- Passing to the boundary case in the relation (8_14) when $\sigma = \lambda$, we obtain the following relation

8_16
$$\left(1 + s\frac{V_{\lambda\mu}}{c}\right)\left(1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V^2_{\mu\lambda}}{c^2}\right) = \frac{1}{\Gamma^2_{\lambda\mu}\Gamma^2_{\mu\lambda}}$$

- Passing to the boundary case in the relation (8_14) when $\sigma = \mu$, we obtain the following relation

8_17
$$\left(1 + s\frac{V_{\mu\lambda}}{c}\right)\left(1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V^2_{\lambda\mu}}{c^2}\right) = \frac{1}{\Gamma^2_{\lambda\mu}\Gamma^2_{\mu\lambda}}$$

Relations Between Systems Own Times and Systems Reciprocal Observed Times

- *By inserting beta1 and beta2 coefficients expressions from (7_10,12) into the expressions of the observing inertial systems own times given in the (5_18), we obtain the following relations*

$$\begin{cases} d\tau_\lambda = \left(1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}^2}{c^2}\right)\Gamma_{\mu\lambda}^2 dT_{\mu\lambda} \\ d\tau_\mu = \left(1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}^2}{c^2}\right)\Gamma_{\lambda\mu}^2 dT_{\lambda\mu} \end{cases} \quad \text{8\_18}$$

- *By inserting beta1 coefficients expressions from (7_10) into the left-hand side relations of (5_19), we obtain the following relations*

$$\begin{cases} dT_{\mu\lambda} = \left(1 + s\frac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu}^2 d\tau_\lambda \\ dT_{\lambda\mu} = \left(1 + s\frac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda}^2 d\tau_\mu \end{cases} \quad \text{8\_19}$$

- *By inserting gamma1 coefficients expressions from (7_09) into the right-hand side relations of (5_19), we obtain the following relations*

$$\begin{cases} \frac{V_{\lambda\mu}}{c} dT_{\lambda\mu} = -\frac{V_{\mu\lambda}}{c}\Gamma_{\mu\lambda}^2 d\tau_\mu \\ \frac{V_{\mu\lambda}}{c} dT_{\mu\lambda} = -\frac{V_{\lambda\mu}}{c}\Gamma_{\lambda\mu}^2 d\tau_\lambda \end{cases} \quad \text{8\_20}$$

Chapter 9

Receiving General Transformation Equations of the First Type

In this chapter we will obtain the first type of transformation equations form, where the alpha1 coefficients are still unknown. The proofs of our obtaining are not so strict, but in the following volumes we will derive the transformation equations of the firs type in the strictest manner, therefore we are not very concerned about it in this volume. In this chapter we also show that the determinants of the transformation equations of the first type are negative quantities.

Comparison Transformation Relations of Relative Velocities Obtained by Two Different Methods

- *In the case of the observing inertial systems, the first type of direct and inverse transformation equations given in (4_12) and (4_13) can be written by the measurement of length as follows*

Direct transformation equations

$$\begin{cases} cdT_{\mu\lambda} = \alpha^1_{\lambda\mu}(cdT_{\lambda\mu}) + (c\alpha^2_{\lambda\mu})dX_{\lambda\mu} \\ dX_{\mu\lambda} = \left(\frac{1}{c}\eta^1_{\lambda\mu}\right)(cdT_{\lambda\mu}) + \eta^2_{\lambda\mu}dX_{\lambda\mu} \end{cases}$$

and

Inverse transformation equations

$$\begin{cases} cdT_{\lambda\mu} = \alpha^1_{\mu\lambda}(cdT_{\mu\lambda}) + (c\alpha^2_{\mu\lambda})dX_{\mu\lambda} \\ dX_{\lambda\mu} = \left(\frac{1}{c}\eta^1_{\mu\lambda}\right)(cdT_{\mu\lambda}) + \eta^2_{\mu\lambda}dX_{\mu\lambda} \end{cases}$$

9_01

- *Using the above transformation equations of first type, we can calculate the transformation relations of direct and inverse relative velocities as shown below.*

$$\begin{cases} \dfrac{V_{\mu\lambda}}{c} = \dfrac{dX_{\mu\lambda}}{cdT_{\mu\lambda}} = \dfrac{\left(\frac{1}{c}\eta^1_{\lambda\mu}\right)(cdT_{\lambda\mu}) + \eta^2_{\lambda\mu}dX_{\lambda\mu}}{\alpha^1_{\lambda\mu}(cdT_{\lambda\mu}) + (c\alpha^2_{\lambda\mu})dX_{\lambda\mu}} = \dfrac{\frac{1}{c}\eta^1_{\lambda\mu} + \eta^2_{\lambda\mu}\frac{V_{\lambda\mu}}{c}}{\alpha^1_{\lambda\mu} + (c\alpha^2_{\lambda\mu})\frac{V_{\lambda\mu}}{c}} \\ \dfrac{V_{\lambda\mu}}{c} = \dfrac{dX_{\lambda\mu}}{cdT_{\lambda\mu}} = \dfrac{\left(\frac{1}{c}\eta^1_{\mu\lambda}\right)(cdT_{\mu\lambda}) + \eta^2_{\mu\lambda}dX_{\mu\lambda}}{\alpha^1_{\mu\lambda}(cdT_{\mu\lambda}) + (c\alpha^2_{\mu\lambda})dX_{\mu\lambda}} = \dfrac{\frac{1}{c}\eta^1_{\mu\lambda} + \eta^2_{\mu\lambda}\frac{V_{\mu\lambda}}{c}}{\alpha^1_{\mu\lambda} + (c\alpha^2_{\mu\lambda})\frac{V_{\mu\lambda}}{c}} \end{cases}$$

9_02

- *New received transformation relations for the relative velocities given above, equating to the Armenian transformation relations of the relative velocities given in (8_08), we get*

$$\begin{cases} \dfrac{V_{\mu\lambda}}{c} = \dfrac{\frac{1}{c}\eta^1_{\lambda\mu} + \eta^2_{\lambda\mu}\frac{V_{\lambda\mu}}{c}}{\alpha^1_{\lambda\mu} + (c\alpha^2_{\lambda\mu})\frac{V_{\lambda\mu}}{c}} = -\dfrac{\frac{V_{\lambda\mu}}{c}}{1 + s\frac{V_{\lambda\mu}}{c}} \\ \dfrac{V_{\lambda\mu}}{c} = \dfrac{\frac{1}{c}\eta^1_{\mu\lambda} + \eta^2_{\mu\lambda}\frac{V_{\mu\lambda}}{c}}{\alpha^1_{\mu\lambda} + (c\alpha^2_{\mu\lambda})\frac{V_{\mu\lambda}}{c}} = -\dfrac{\frac{V_{\mu\lambda}}{c}}{1 + s\frac{V_{\mu\lambda}}{c}} \end{cases}$$

9_03

Calculation of the Coefficients of the Transformation Equations of the First Type

- By simplifying the equations given in (9_03) we obtain the following system of equations

9_04

$$\begin{cases} \left(1+s\dfrac{V_{\lambda\mu}}{c}\right)\left(\dfrac{1}{c}\eta^1_{\lambda\mu}+\eta^2_{\lambda\mu}\dfrac{V_{\lambda\mu}}{c}\right)+\dfrac{V_{\lambda\mu}}{c}\left[\alpha^1_{\lambda\mu}+(c\alpha^2_{\lambda\mu})\dfrac{V_{\lambda\mu}}{c}\right] = 0 \\ \left(1+s\dfrac{V_{\mu\lambda}}{c}\right)\left(\dfrac{1}{c}\eta^1_{\mu\lambda}+\eta^2_{\mu\lambda}\dfrac{V_{\mu\lambda}}{c}\right)+\dfrac{V_{\mu\lambda}}{c}\left[\alpha^1_{\mu\lambda}+(c\alpha^2_{\mu\lambda})\dfrac{V_{\mu\lambda}}{c}\right] = 0 \end{cases}$$

- The above system of equations can be written and expanded by the degree of corresponding relative velocities

9_05

$$\begin{cases} \dfrac{1}{c}\eta^1_{\lambda\mu}+\left(\alpha^1_{\lambda\mu}+\eta^2_{\lambda\mu}+\dfrac{1}{c}s\eta^1_{\lambda\mu}\right)\dfrac{V_{\lambda\mu}}{c}+\left(c\alpha^2_{\lambda\mu}+s\eta^2_{\lambda\mu}\right)\dfrac{V^2_{\lambda\mu}}{c^2} = 0 \\ \dfrac{1}{c}\eta^1_{\mu\lambda}+\left(\alpha_{\mu\lambda}+\eta^2_{\mu\lambda}+\dfrac{1}{c}s\eta^1_{\mu\lambda}\right)\dfrac{V_{\mu\lambda}}{c}+\left(c\alpha^2_{\mu\lambda}+s\eta^2_{\mu\lambda}\right)\dfrac{V^2_{\mu\lambda}}{c^2} = 0 \end{cases}$$

- In the above system of equations, coefficients of all degrees of relative velocities must be equal to zero

9_06

$$\begin{cases} \eta^1_{\lambda\mu} = 0 \\ \alpha^1_{\lambda\mu}+\eta^2_{\lambda\mu}+\dfrac{1}{c}s\eta^1_{\lambda\mu} = 0 \\ c\alpha^2_{\lambda\mu}+s\eta^2_{\lambda\mu} = 0 \end{cases} \quad \text{and} \quad \begin{cases} \eta^1_{\mu\lambda} = 0 \\ \alpha_{\mu\lambda}+\eta^2_{\mu\lambda}+\dfrac{1}{c}s\eta^1_{\mu\lambda} = 0 \\ c\alpha^2_{\mu\lambda}+s\eta^2_{\mu\lambda} = 0 \end{cases}$$

- Using the above system of equations, we obtain the following values and expressions for the coefficients of the transformation equations of the first type

9_07

$$\begin{cases} \eta^1_{\lambda\mu} = 0 \\ \eta^2_{\lambda\mu} = -\alpha^1_{\lambda\mu} \\ \dfrac{c\alpha^2_{\lambda\mu}}{\alpha^1_{\lambda\mu}} = s \end{cases} \quad \text{and} \quad \begin{cases} \eta^1_{\mu\lambda} = 0 \\ \eta^2_{\mu\lambda} = -\alpha^1_{\mu\lambda} \\ \dfrac{c\alpha^2_{\mu\lambda}}{\alpha^1_{\mu\lambda}} = s \end{cases}$$

Transformation Equations of the First Type

- *By placing the values and expressions of coefficients given in (9_07) into the direct and inverse transformation equations of the first type given in (9_01), we will obtain*

Direct transformation equations and Inverse transformation equations

$$\left\{\begin{array}{lcl} cdT_{\mu\lambda} & = & \alpha^1_{\lambda\mu}(cdT_{\lambda\mu}+sdX_{\lambda\mu}) \\ dX_{\mu\lambda} & = & -\alpha^1_{\lambda\mu}dX_{\lambda\mu} \end{array}\right. \quad \text{and} \quad \left\{\begin{array}{lcl} cdT_{\lambda\mu} & = & \alpha^1_{\mu\lambda}(cdT_{\mu\lambda}+sdX_{\mu\lambda}) \\ dX_{\lambda\mu} & = & -\alpha^1_{\mu\lambda}dX_{\mu\lambda} \end{array}\right. \tag{9_08}$$

- *From the above transformation equations of the reciprocal observed coordinates we obtain the following relations between the reciprocal infinitesimal observed times*

$$\left\{\begin{array}{lcl} dT_{\lambda\mu} & = & \alpha^1_{\mu\lambda}\left(1+s\dfrac{V_{\mu\lambda}}{c}\right)dT_{\mu\lambda} \\ dT_{\mu\lambda} & = & \alpha^1_{\lambda\mu}\left(1+s\dfrac{V_{\lambda\mu}}{c}\right)dT_{\lambda\mu} \end{array}\right. \tag{9_09}$$

- *From the above observed time relations it follows that the coefficients alpha1 satisfy the condition of inversion*

$$\alpha^1_{\lambda\mu}\alpha^1_{\mu\lambda} = 1 \tag{9_10}$$

For simplicity purposes we can assume that the coefficients of alpha1 are equal to one. But any admission without proof can deprive us of the pleasure of finding the most general solution, and we would therefore consider that alpha1 coefficients still have different values other than 1 until proven otherwise. 9_11

Determination of Values Alpha1 Coefficients

- We recognize that in the most general case, the alpha1 coefficients must have positive values different than 1, and let the more brave researchers discuss the case where alpha1 coefficients can have negative values

9_12

$$\begin{cases} \alpha^1_{\lambda\mu} \neq 1 > 0 \\ \alpha^1_{\mu\lambda} \neq 1 > 0 \end{cases}$$

- In the case of first type of transformations, the determinants of the most general transformation equations given in (9_08) can be expressed by the coefficients of alpha1 as follows

9_13

$$\begin{cases} D^1_{\lambda\mu} = -(\alpha^1_{\lambda\mu})^2 < 0 \\ D^1_{\mu\lambda} = -(\alpha^1_{\mu\lambda})^2 < 0 \end{cases}$$

- Therefore the values of the alpha1 coefficients will depend on the corresponding determinants of the first type of transformations

9_14

$$\begin{cases} \alpha^1_{\lambda\mu} = \sqrt{-D^1_{\lambda\mu}} \\ \alpha^1_{\mu\lambda} = \sqrt{-D^1_{\mu\lambda}} \end{cases}$$

- In the boundary case where the observation systems coincide with each other, will occur when we accept $\lambda = \mu$, then under this condition alpha 1 coefficients' own values will be equal to 1

9_15

$$\alpha^1_{\lambda\lambda} = \alpha^1_{\mu\mu} = 1$$

Chapter 10

Defining and Investigating Armenian Invariant Intervals in the Case of First and Second Types of Transformations

In the Armenian Theory of Time-Space, we recognize that incidents occur due to causality, because we discuss cases of particles motion or field propagation, and therefore the squares of the infinitesimal Armenian interval must always be positive quantities, unless stated otherwise. And most likely we live in a universe, where the above statement is true and therefore the universal constant quantities s and g satisfy the following conditions.

$$g \neq \frac{1}{4}s^2$$

Definition of Quadratic Expressions of the Armenian Interval in the Case of the First Type of Transformations

- *In the case of reciprocal motion observation between two observing inertial systems, the determination of square expressions of infinitesimal Armenian intervals, which, due to causality, always must be positive quantities*

10_01

$$\begin{cases} (d\sigma_{\lambda\mu})^2 = (cdT_{\lambda\mu})^2 + s(cdT_{\lambda\mu})dX_{\lambda\mu} + g(dX_{\lambda\mu})^2 > 0 \\ (d\sigma_{\mu\lambda})^2 = (cdT_{\mu\lambda})^2 + s(cdT_{\mu\lambda})dX_{\mu\lambda} + g(dX_{\mu\lambda})^2 > 0 \end{cases}$$

- *The quadratic expressions of the above mentioned infinitesimal Armenian intervals can also be represented by the reciprocally observed relative velocities as follows*

10_02

$$\begin{cases} (d\sigma_{\lambda\mu})^2 = \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}^2}{c^2}\right)(cdT_{\lambda\mu})^2 > 0 \\ (d\sigma_{\mu\lambda})^2 = \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}^2}{c^2}\right)(cdT_{\mu\lambda})^2 > 0 \end{cases}$$

- *From the above quadratic expressions of the infinitesimal Armenian intervals follows the domains of determination depending on the direct and inverse relative velocities*

10_03

$$\begin{cases} 1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}^2}{c^2} > 0 \\ 1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}^2}{c^2} > 0 \end{cases}$$

- *Now let us calculate the quadratic expressions of the infinitesimal Armenian intervals given in (10_01) in the boundary case when the observational systems coincide with each other, which will happen under the conditions $\mu = \lambda$ or $\lambda = \mu$*

10_04

$$\begin{cases} \mu = \lambda \rightarrow (d\sigma_{\lambda\lambda})^2 = (cdT_{\lambda\lambda})^2 + s(cdT_{\lambda\lambda})dX_{\lambda\lambda} + g(dX_{\lambda\lambda})^2 = (cd\tau_{\lambda})^2 \\ \lambda = \mu \rightarrow (d\sigma_{\mu\mu})^2 = (cdT_{\mu\mu})^2 + s(cdT_{\mu\mu})dX_{\mu\mu} + g(dX_{\mu\mu})^2 = (cd\tau_{\mu})^2 \end{cases}$$

The Values of Determinants of the Transformation Equations in the Case of First Type of Transformation

- *If we observe the reciprocal motion of the inertial systems, then substituting corresponding transformation equations of the coordinates given in (9_08) into the quadratic expressions of the infinitesimal Armenian intervals given in (10_01), we obtain the following expressions*

$$\begin{cases} (d\text{Ե}_{\lambda\mu})^2 = (cdT_{\lambda\mu})^2 + s(cdT_{\lambda\mu})dX_{\lambda\mu} + g(dX_{\lambda\mu})^2 = \\ = (\alpha^1_{\mu\lambda})^2\left[(cdT_{\mu\lambda})^2 + s(cdT_{\mu\lambda})dX_{\mu\lambda} + g(dX_{\mu\lambda})^2\right] = (\alpha^1_{\mu\lambda})^2(d\text{Ե}_{\mu\lambda})^2 \\ (d\text{Ե}_{\mu\lambda})^2 = (cdT_{\mu\lambda})^2 + s(cdT_{\mu\lambda})dX_{\mu\lambda} + g(dX_{\mu\lambda})^2 = \\ = (\alpha^1_{\lambda\mu})^2\left[(cdT_{\lambda\mu})^2 + s(cdT_{\lambda\mu})dX_{\lambda\mu} + g(dX_{\lambda\mu})^2\right] = (\alpha^1_{\lambda\mu})^2(d\text{Ե}_{\lambda\mu})^2 \end{cases} \quad \text{10\_05}$$

- *Writing together the above two transformations of the quadratic expressions of the infinitesimal Armenian intervals, and then using the first postulate of equality of the Armenian intervals, we get*

$$\begin{cases} (d\text{Ե}_{\xi})^2 = (d\text{Ե}_{\lambda\mu})^2 = (\alpha^1_{\mu\lambda})^2(d\text{Ե}_{\mu\lambda})^2 \\ (d\text{Ե}_{\xi})^2 = (d\text{Ե}_{\mu\lambda})^2 = (\alpha^1_{\lambda\mu})^2(d\text{Ե}_{\lambda\mu})^2 \end{cases} \Rightarrow \begin{cases} (\alpha^1_{\lambda\mu})^2 = 1 \\ (\alpha^1_{\mu\lambda})^2 = 1 \end{cases} \quad \text{10\_06}$$

- *According to (9_12) and (10_06), we obtain that the values of alpha1 coefficients, which are equal to positive 1, and therefore from (9_13) we obtain that the values of the determinants of first type transformation equations, which will be equal to negative 1, and from (9_09) we will obtain Armenian relations between reciprocally observed times*

$$\begin{cases} \alpha^1_{\lambda\mu} = 1 \\ \alpha^1_{\mu\lambda} = 1 \end{cases} \Rightarrow \begin{cases} D^1_{\lambda\mu} = -1 \\ D^1_{\mu\lambda} = -1 \end{cases} \text{ and } \begin{cases} dT_{\lambda\mu} = \left(1 + s\dfrac{V_{\mu\lambda}}{c}\right)dT_{\mu\lambda} \\ dT_{\mu\lambda} = \left(1 + s\dfrac{V_{\lambda\mu}}{c}\right)dT_{\lambda\mu} \end{cases} \quad \text{10\_07}$$

- *Substituting from the above values of the alpha1 coefficients into (9_08), we will obtain the Armenian transformation equations for reciprocally observed coordinates*

Direct transformation equations | Inverse transformation equations

$$\begin{cases} cdT_{\mu\lambda} = cdT_{\lambda\mu} + sdX_{\lambda\mu} \\ dX_{\mu\lambda} = -dX_{\lambda\mu} \end{cases} \text{ and } \begin{cases} cdT_{\lambda\mu} = cdT_{\mu\lambda} + sdX_{\mu\lambda} \\ dX_{\lambda\mu} = -dX_{\mu\lambda} \end{cases} \quad \text{10\_08}$$

Definition of the Quadratic Expressions of the infinitesimal Armenian Intervals for the Second Type of Transformations

- *Definition of the quadratic expressions of the observed particle's infinitesimal Armenian intervals, which due to the causal relation, must be a positive quantity*

10_09

$$\begin{cases} (d\text{ƃ}_{\lambda\sigma})^2 & = & (cdT_{\lambda\sigma})^2 + s(cdT_{\lambda\sigma})dX_{\lambda\sigma} + g(dX_{\lambda\sigma})^2 & > & 0 \\ (d\text{ƃ}_{\mu\sigma})^2 & = & (cdT_{\mu\sigma})^2 + s(cdT_{\mu\sigma})dX_{\mu\sigma} + g(dX_{\mu\sigma})^2 & > & 0 \end{cases}$$

- *The above quadratic expressions of the infinitesimal Armenian intervals can also be represented by the observed particle velocities as follows*

10_10

$$\begin{cases} (d\text{ƃ}_{\lambda\sigma})^2 & = & \left(1 + s\dfrac{U_{\lambda\sigma}}{c} + g\dfrac{U_{\lambda\sigma}^2}{c^2}\right)(cdT_{\lambda\sigma})^2 & > & 0 \\ (d\text{ƃ}_{\mu\sigma})^2 & = & \left(1 + s\dfrac{U_{\mu\sigma}}{c} + g\dfrac{U_{\mu\sigma}^2}{c^2}\right)(cdT_{\mu\sigma})^2 & > & 0 \end{cases}$$

- *From the above quadratic expressions of the infinitesimal Armenian intervals, follows the domains of determination depending on the particle's velocities with respect to the inertial observing systems λ and μ*

10_11

$$\begin{cases} 1 + s\dfrac{U_{\lambda\sigma}}{c} + g\dfrac{U_{\lambda\sigma}^2}{c^2} & > & 0 \\ 1 + s\dfrac{U_{\mu\sigma}}{c} + g\dfrac{U_{\mu\sigma}^2}{c^2} & > & 0 \end{cases}$$

- *Quadratic expressions of the infinitesimal Armenian intervals given in (10_09), in the boundary conditions when $\sigma = \lambda$ and $\sigma = \mu$*

10_12

$$\begin{cases} \sigma = \lambda \;\rightarrow\; (d\text{ƃ}_{\lambda\lambda})^2 & = & (cdT_{\lambda\lambda})^2 + s(cdT_{\lambda\lambda})dX_{\lambda\lambda} + g(dX_{\lambda\lambda})^2 & = & (cd\tau_{\lambda})^2 \\ \sigma = \mu \;\rightarrow\; (d\text{ƃ}_{\mu\mu})^2 & = & (cdT_{\mu\mu})^2 + s(cdT_{\mu\mu})dX_{\mu\mu} + g(dX_{\mu\mu})^2 & = & (cd\tau_{\mu})^2 \end{cases}$$

The Values of Transformation Equations Determinants in the Case of the Second Type of Transformation

- *In the case of second type transformation, substituting inverse transformation equations of the particle coordinates given in (8_02) into the first expression of the infinitesimal Armenian interval given in (10_09), we obtain the following expression*

$$\begin{aligned}(d\text{Ƃ}_{\lambda\sigma})^2 &= \left[(\mathcal{B}^1_{\mu\lambda})^2 + s\mathcal{B}^1_{\mu\lambda}\left(\tfrac{1}{c}\Gamma^1_{\mu\lambda}\right) + g\left(\tfrac{1}{c}\Gamma^1_{\mu\lambda}\right)^2\right](cdT_{\mu\sigma})^2 + \\ &+2\left[\mathcal{B}^1_{\mu\lambda}\left(c\mathcal{B}^2_{\mu\lambda} + \tfrac{1}{2}s\Gamma^2_{\mu\lambda}\right) + \left(\tfrac{1}{c}\Gamma^1_{\mu\lambda}\right)\left(\tfrac{1}{2}sc\mathcal{B}^2_{\mu\lambda} + g\Gamma^2_{\mu\lambda}\right)\right](cdT_{\mu\sigma})(dX_{\mu\sigma}) + \\ &+\left[(c\mathcal{B}^2_{\mu\lambda})^2 + s(c\mathcal{B}^2_{\mu\lambda})\Gamma^2_{\mu\lambda} + g(\Gamma^2_{\mu\lambda})^2\right](dX_{\mu\sigma})^2\end{aligned} \qquad \text{10\_13}$$

- *In the case of second type transformation, substituting direct transformation equations of the particle coordinates given in (8_01) into the second expression of the infinitesimal Armenian interval given in (10_09), we obtain the following expression*

$$\begin{aligned}(d\text{Ƃ}_{\mu\sigma})^2 &= \left[(\mathcal{B}^1_{\lambda\mu})^2 + s\mathcal{B}^1_{\lambda\mu}\left(\tfrac{1}{c}\Gamma^1_{\lambda\mu}\right) + g\left(\tfrac{1}{c}\Gamma^1_{\lambda\mu}\right)^2\right](cdT_{\lambda\sigma})^2 + \\ &+2\left[\mathcal{B}^1_{\lambda\mu}\left(c\mathcal{B}^2_{\lambda\mu} + \tfrac{1}{2}s\Gamma^2_{\lambda\mu}\right) + \left(\tfrac{1}{c}\Gamma^1_{\lambda\mu}\right)\left(\tfrac{1}{2}sc\mathcal{B}^2_{\lambda\mu} + g\Gamma^2_{\lambda\mu}\right)\right](cdT_{\lambda\sigma})(dX_{\lambda\sigma}) + \\ &+\left[(c\mathcal{B}^2_{\lambda\mu})^2 + s(c\mathcal{B}^2_{\lambda\mu})\Gamma^2_{\lambda\mu} + g(\Gamma^2_{\lambda\mu})^2\right](dX_{\lambda\sigma})^2\end{aligned} \qquad \text{10\_14}$$

- *Putting the relations of the determinants given in (7_17,19,21), into above two transformations of the quadratic form of the infinitesimal Armenian intervals, we will obtain the following relations*

$$\begin{cases}(d\text{Ƃ}_{\lambda\sigma})^2 = D^2_{\mu\lambda}\left[(cdT_{\mu\sigma})^2 + s(cdT_{\mu\sigma})dX_{\mu\sigma} + g(dX_{\mu\sigma})^2\right] = D^2_{\mu\lambda}(d\text{Ƃ}_{\mu\sigma})^2 \\ (d\text{Ƃ}_{\mu\sigma})^2 = D^2_{\lambda\mu}\left[(cdT_{\lambda\sigma})^2 + s(cdT_{\lambda\sigma})dX_{\lambda\sigma} + g(dX_{\lambda\sigma})^2\right] = D^2_{\lambda\mu}(d\text{Ƃ}_{\lambda\sigma})^2\end{cases} \qquad \text{10\_15}$$

- *Using the first postulate of equality Armenian intervals and applying it to (10_15), we will find that the values of the second type transformation determinants are equal to positive 1*

$$\underline{(d\text{Ƃ}_{\xi})^2 = (d\text{Ƃ}_{\lambda\sigma})^2 = (d\text{Ƃ}_{\mu\sigma})^2} \;\rightarrow\; \underline{D^2_{\lambda\mu} = D^2_{\mu\lambda} = 1} \qquad \text{10\_16}$$

Second Type Transformation Determinants Values of Being Equal to Positive One

- *The relations between transformations coefficients given in (6_10) and (6_11) can be written together in the following way*

10_17

$$\begin{cases} \mathcal{B}^2_{\lambda\mu} = -\ \mathcal{B}^2_{\mu\lambda} \\ \Gamma^1_{\lambda\mu} = -\ \Gamma^1_{\mu\lambda} \end{cases} \quad \text{և} \quad \begin{cases} \mathcal{B}^1_{\lambda\mu} = +\ \Gamma^2_{\mu\lambda} \\ \Gamma^2_{\lambda\mu} = +\ \mathcal{B}^1_{\mu\lambda} \end{cases}$$

- *The relations given in (7_18) will become*

10_18

$$\begin{cases} (\Gamma^2_{\lambda\mu})^2 - s\Gamma^2_{\lambda\mu}\left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right) + g\left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)^2 = 1 \\ (\Gamma^2_{\mu\lambda})^2 - s\Gamma^2_{\mu\lambda}\left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right) + g\left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)^2 = 1 \end{cases}$$

- *The relations given in (7_20) will become*

10_19

$$\begin{cases} (c\mathcal{B}^2_{\lambda\mu})^2 - s(c\mathcal{B}^2_{\lambda\mu})\mathcal{B}^1_{\lambda\mu} + g(\mathcal{B}^1_{\lambda\mu})^2 = g \\ (c\mathcal{B}^2_{\mu\lambda})^2 - s(c\mathcal{B}^2_{\mu\lambda})\mathcal{B}^1_{\mu\lambda} + g(\mathcal{B}^1_{\mu\lambda})^2 = g \end{cases}$$

- *The relations given in (7_21) will become*

10_20

$$\begin{cases} \mathcal{B}^1_{\lambda\mu}\left(c\mathcal{B}^2_{\lambda\mu} + \frac{1}{2}s\Gamma^2_{\lambda\mu}\right) + \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)\left(\frac{1}{2}sc\mathcal{B}^2_{\lambda\mu} + g\Gamma^2_{\lambda\mu}\right) = \frac{1}{2}s \\ \mathcal{B}^1_{\mu\lambda}\left(c\mathcal{B}^2_{\mu\lambda} + \frac{1}{2}s\Gamma^2_{\mu\lambda}\right) + \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)\left(\frac{1}{2}sc\mathcal{B}^2_{\mu\lambda} + g\Gamma^2_{\mu\lambda}\right) = \frac{1}{2}s \end{cases}$$

Conclusions From the First Postulate of the Armenian Theory of Time - Space

- *The first postulate of the Armenian Theory of Time-Space, according to (10_06) and (10_16), can be illustrated in the following way, because the Armenian interval is invariant*

$$\left\{\begin{array}{ccccc} (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\lambda\mu})^2 & = & (d\text{Ե}_{\mu\lambda})^2 \\ & & \Vert & & \Vert \\ (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\lambda\sigma})^2 & = & (d\text{Ե}_{\mu\sigma})^2 \end{array}\right. \qquad 10\_21$$

- *The above illustrated view of the first postulate of the Armenian theory of time-space can also be represented in the following way*

$$\left\{\begin{array}{ccccc} (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\lambda\sigma})^2 & = & (d\text{Ե}_{\lambda\mu})^2 \\ & & \Vert & & \Vert \\ (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\mu\sigma})^2 & = & (d\text{Ե}_{\mu\lambda})^2 \end{array}\right. \qquad 10\_22$$

- *In the case of second type of transformation, using the own values of the quadratic infinitesimal Armenian Intervals given in (10_12), we will get the following important conclusion*

$$\left\{\begin{array}{ccccc} (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\lambda\sigma})^2 & = & (c\,d\tau_{\lambda})^2 \\ (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\mu\sigma})^2 & = & (c\,d\tau_{\mu})^2 \end{array}\right. \qquad 10\_23$$

- *The infinitesimal Armenian interval given in (10_22), according to (10_23), can be represented in a more complete illustrated form as follows, which is true for any value of index* σ

$$\left\{\begin{array}{ccccccc} (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\lambda\sigma})^2 & = & (d\text{Ե}_{\lambda\mu})^2 & = & (c\,d\tau_{\lambda})^2 \\ & & \Vert & & \Vert & & \Vert \\ (d\text{Ե}_{\text{ջ}})^2 & = & (d\text{Ե}_{\mu\sigma})^2 & = & (d\text{Ե}_{\mu\lambda})^2 & = & (c\,d\tau_{\mu})^2 \end{array}\right. \qquad 10\_24$$

The Infinitesimal Armenian Invariant Interval Expressed in the Corresponding Velocities

- *Only the parallel equations of the illustrated form of the quadratic infinitesimal Armenian invariant interval given in (10_24), according to (10_02, 10), can be written together and with the corresponding velocities as follows*

10_25

$$\begin{cases} \left(1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}^2}{c^2}\right)(cdT_{\lambda\sigma})^2 = \left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}^2}{c^2}\right)(cdT_{\lambda\mu})^2 = (cd\tau_\lambda)^2 \\ \left(1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\mu\sigma}^2}{c^2}\right)(cdT_{\mu\sigma})^2 = \left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}^2}{c^2}\right)(cdT_{\mu\lambda})^2 = (cd\tau_\mu)^2 \end{cases}$$

- *The first and second vertical equations of the quadratic form of the infinitesimal Armenian invariant interval given in (10_24), can be written together and with the corresponding velocities as follows*

10_26

$$\begin{cases} \left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}^2}{c^2}\right)(cdT_{\lambda\mu})^2 = \left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}^2}{c^2}\right)(cdT_{\mu\lambda})^2 \\ \left(1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}^2}{c^2}\right)(cdT_{\lambda\sigma})^2 = \left(1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\mu\sigma}^2}{c^2}\right)(cdT_{\mu\sigma})^2 \end{cases}$$

- *Only the third vertical equation of the illustrated form of the quadratic infinitesimal Armenian invariant interval given in (10_24), follows that the observing inertial system's own times are equal*

10_27

$$d\tau_\lambda = d\tau_\mu$$

10_28

The 21st century will be the epoch of the triumph of Armenian science
(14 October 2016, Yerevan, Armenia)

Chapter 11

From Armenian Transformation Equations of Direct Moving Particle Obtaining Armenian Transformation Equations of the Reflected Moving Particle

In this section we prove that the Armenian transformation equations of reflected particle coordinates have the mathematical form of Armenian transformation equations of direct particle coordinates. Consequently, the form of direct and reflected particle coordinates transformation equation forms has a universal character.

All Possible Transformation Equations of the Particle σ Coordinates When Observing it from the Systems λ and μ

- *Similar to (10_08), first type of transformation equations between (λ, σ) reciprocal observed system coordinates will be*

11_01

$$\begin{cases} cdT_{\lambda\sigma} &= cdT_{\sigma\lambda} + sdX_{\sigma\lambda} \\ dX_{\lambda\sigma} &= -dX_{\sigma\lambda} \end{cases} \quad \text{and} \quad \begin{cases} cdT_{\sigma\lambda} &= cdT_{\lambda\sigma} + sdX_{\lambda\sigma} \\ dX_{\sigma\lambda} &= -dX_{\lambda\sigma} \end{cases}$$

- *Similar to (10_08), first type of transformation equations between (μ, σ) reciprocal observed system coordinates will be*

11_02

$$\begin{cases} cdT_{\mu\sigma} &= cdT_{\sigma\mu} + sdX_{\sigma\mu} \\ dX_{\mu\sigma} &= -dX_{\sigma\mu} \end{cases} \quad \text{and} \quad \begin{cases} cdT_{\sigma\mu} &= cdT_{\mu\sigma} + sdX_{\mu\sigma} \\ dX_{\sigma\mu} &= -dX_{\mu\sigma} \end{cases}$$

- *Similar to (10_07), Armenian relations between reciprocally observed times between pair of systems (λ, σ) and (μ, σ) will be*

11_03

$$\begin{cases} dT_{\sigma\lambda} &= \left(1 + s\dfrac{U_{\lambda\sigma}}{c}\right) dT_{\lambda\sigma} \\ dT_{\lambda\sigma} &= \left(1 + s\dfrac{U_{\sigma\lambda}}{c}\right) dT_{\sigma\lambda} \end{cases} \quad \text{and} \quad \begin{cases} dT_{\sigma\mu} &= \left(1 + s\dfrac{U_{\mu\sigma}}{c}\right) dT_{\mu\sigma} \\ dT_{\mu\sigma} &= \left(1 + s\dfrac{U_{\sigma\mu}}{c}\right) dT_{\sigma\mu} \end{cases}$$

- *In the case of when observing the direct motion of a σ particle from the systems λ and μ, the transformation equations of the particle coordinates will be*

11_04

Direct transformation equations — Inverse transformation equations

$$\begin{cases} cdT_{\mu\sigma} &= \mathcal{B}^1_{\lambda\mu}(cdT_{\lambda\sigma}) + (c\mathcal{B}^2_{\lambda\mu})dX_{\lambda\sigma} \\ dX_{\mu\sigma} &= \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)(cdT_{\lambda\sigma}) + \Gamma^2_{\lambda\mu}dX_{\lambda\sigma} \end{cases} \quad \text{and} \quad \begin{cases} cdT_{\lambda\sigma} &= \mathcal{B}^1_{\mu\lambda}(cdT_{\mu\sigma}) + (c\mathcal{B}^2_{\mu\lambda})dX_{\mu\sigma} \\ dX_{\lambda\sigma} &= \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)(cdT_{\mu\sigma}) + \Gamma^2_{\mu\lambda}dX_{\mu\sigma} \end{cases}$$

In the Case of Second Type Transformation, The Representation of Transformation Equations by Reflected coordinates of the particle

- By inserting σ particle direct coordinates given in (11_01,02) into the direct transformation equations given in (11_04), we obtain the particle's reflected coordinates direct transformation equations in the implicit form

$$\begin{cases} cdT_{\sigma\mu} + sdX_{\sigma\mu} &= \mathcal{B}^1_{\lambda\mu}(cdT_{\sigma\lambda} + sdX_{\sigma\lambda}) - (c\mathcal{B}^2_{\lambda\mu})dX_{\sigma\lambda} \\ -dX_{\sigma\mu} &= \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)(cdT_{\sigma\lambda} + sdX_{\sigma\lambda}) - \Gamma^2_{\lambda\mu}dX_{\sigma\lambda} \end{cases} \qquad \text{11\_05}$$

- By inserting σ particle direct coordinates given in (11_01,02) into the inverse transformation equations given in (11_04), we obtain the particle's reflected coordinates inverse transformation equations in the implicit form

$$\begin{cases} cdT_{\sigma\lambda} + sdX_{\sigma\lambda} &= \mathcal{B}^1_{\mu\lambda}(cdT_{\sigma\mu} + sdX_{\sigma\mu}) - (c\mathcal{B}^2_{\mu\lambda})dX_{\sigma\mu} \\ -dX_{\sigma\lambda} &= \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)(cdT_{\sigma\mu} + sdX_{\sigma\mu}) - \Gamma^2_{\mu\lambda}dX_{\sigma\mu} \end{cases} \qquad \text{11\_06}$$

- In the transformation equations given in (11_05), according to (10_17), replacing the transformation direct coefficients with inverse coefficients, we obtain

$$\begin{cases} cdT_{\sigma\mu} + sdX_{\sigma\mu} &= \Gamma^2_{\mu\lambda}(cdT_{\sigma\lambda}) + (s\Gamma^2_{\mu\lambda} + c\mathcal{B}^2_{\mu\lambda})dX_{\sigma\lambda} \\ dX_{\sigma\mu} &= \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)(cdT_{\sigma\lambda}) + \left(\mathcal{B}^1_{\mu\lambda} + s\frac{1}{c}\Gamma^1_{\mu\lambda}\right)dX_{\sigma\lambda} \end{cases} \qquad \text{11\_07}$$

- In the transformation equations given in (11_06), according to (10_17), replacing the transformation inverse coefficients with direct coefficients, we obtain

$$\begin{cases} cdT_{\sigma\lambda} + sdX_{\sigma\lambda} &= \Gamma^2_{\lambda\mu}(cdT_{\sigma\mu}) + (s\Gamma^2_{\lambda\mu} + c\mathcal{B}^2_{\lambda\mu})dX_{\sigma\mu} \\ dX_{\sigma\lambda} &= \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)(cdT_{\sigma\mu}) + \left(\mathcal{B}^1_{\lambda\mu} + s\frac{1}{c}\Gamma^1_{\lambda\mu}\right)dX_{\sigma\mu} \end{cases} \qquad \text{11\_08}$$

In the Case of the Second Type of Transformation Particle's Reflected Coordinates Transformation Equations

- *Then, inserting the inverse beta1 coefficient expression given in (7_08) into the second equation of (11_07), we will obtain*

11_09

$$\begin{cases} cdT_{\sigma\mu} + sdX_{\sigma\mu} = \Gamma^2_{\mu\lambda}(cdT_{\sigma\lambda}) + (c\mathcal{B}^2_{\mu\lambda} + s\Gamma^2_{\mu\lambda})dX_{\sigma\lambda} \\ dX_{\sigma\mu} = \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)(cdT_{\sigma\lambda}) + \Gamma^2_{\mu\lambda}dX_{\sigma\lambda} \end{cases}$$

- *The same way, inserting the direct beta1 coefficient expression given in (7_08) into the second equation of (11_08), we will obtain*

11_10

$$\begin{cases} cdT_{\sigma\lambda} + sdX_{\sigma\lambda} = \Gamma^2_{\lambda\mu}(cdT_{\sigma\mu}) + (c\mathcal{B}^2_{\lambda\mu} + s\Gamma^2_{\lambda\mu})dX_{\sigma\mu} \\ dX_{\sigma\lambda} = \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)(cdT_{\sigma\mu}) + \Gamma^2_{\lambda\mu}dX_{\sigma\mu} \end{cases}$$

- *From the joint solution of the system of equations given in (11_09) we can determine the direct transformation equations of the reflected coordinates of the particle*

11_11

$$\begin{cases} cdT_{\sigma\mu} = \mathcal{B}^1_{\mu\lambda}(cdT_{\sigma\lambda}) + (c\mathcal{B}^2_{\mu\lambda})dX_{\sigma\lambda} \\ dX_{\sigma\mu} = \left(\frac{1}{c}\Gamma^1_{\mu\lambda}\right)(cdT_{\sigma\lambda}) + \Gamma^2_{\mu\lambda}dX_{\sigma\lambda} \end{cases}$$

- *From the joint solution of the system of equations given in (11_10) we can determine the inverse transformation equations of the reflected coordinates of the particle*

11_12

$$\begin{cases} cdT_{\sigma\lambda} = \mathcal{B}^1_{\lambda\mu}(cdT_{\sigma\mu}) + (c\mathcal{B}^2_{\lambda\mu})dX_{\sigma\mu} \\ dX_{\sigma\lambda} = \left(\frac{1}{c}\Gamma^1_{\lambda\mu}\right)(cdT_{\sigma\mu}) + \Gamma^2_{\lambda\mu}dX_{\sigma\mu} \end{cases}$$

Armenian Transformation Equations in the Case of Second Type of Transformation

➤ *In the case of particle's direct motion observation, according to (8_03), the Armenian direct transformation equations of particle coordinates will be*

$$\begin{cases} cdT_{\mu\sigma} = \left[\left(1 + s\dfrac{V_{\lambda\mu}}{c}\right)(cdT_{\lambda\sigma}) + \left(g\dfrac{V_{\lambda\mu}}{c}\right)dX_{\lambda\sigma}\right]\Gamma^2_{\lambda\mu} \\ dX_{\mu\sigma} = \left[dX_{\lambda\sigma} - \dfrac{V_{\lambda\mu}}{c}(cdT_{\lambda\sigma})\right]\Gamma^2_{\lambda\mu} \end{cases} \tag{11_13}$$

➤ *In the case of particle's direct motion observation, according to (8_04), the Armenian inverse transformation equations of particle coordinates will be*

$$\begin{cases} cdT_{\lambda\sigma} = \left[\left(1 + s\dfrac{V_{\mu\lambda}}{c}\right)(cdT_{\mu\sigma}) + \left(g\dfrac{V_{\mu\lambda}}{c}\right)dX_{\mu\sigma}\right]\Gamma^2_{\mu\lambda} \\ dX_{\lambda\sigma} = \left[dX_{\mu\sigma} - \dfrac{V_{\mu\lambda}}{c}(cdT_{\mu\sigma})\right]\Gamma^2_{\mu\lambda} \end{cases} \tag{11_14}$$

➤ *Inserting transformation coefficients expressions from (7_09,10,12) into (11_11), we get the Armenian direct transformation equations of particle's reflected coordinates*

$$\begin{cases} cdT_{\sigma\mu} = \left[\left(1 + s\dfrac{V_{\mu\lambda}}{c}\right)(cdT_{\sigma\lambda}) + \left(g\dfrac{V_{\mu\lambda}}{c}\right)dX_{\sigma\lambda}\right]\Gamma^2_{\mu\lambda} \\ dX_{\sigma\mu} = \left[dX_{\sigma\lambda} - \dfrac{V_{\mu\lambda}}{c}(cdT_{\sigma\lambda})\right]\Gamma^2_{\mu\lambda} \end{cases} \tag{11_15}$$

➤ *Inserting transformation coefficients expressions from (7_09,10,12) into (11_12), we get the Armenian inverse transformation equations of particle's reflected coordinates*

$$\begin{cases} cdT_{\sigma\lambda} = \left[\left(1 + s\dfrac{V_{\lambda\mu}}{c}\right)(cdT_{\sigma\mu}) + \left(g\dfrac{V_{\lambda\mu}}{c}\right)dX_{\sigma\mu}\right]\Gamma^2_{\lambda\mu} \\ dX_{\sigma\lambda} = \left[dX_{\sigma\mu} - \dfrac{V_{\lambda\mu}}{c}(cdT_{\sigma\mu})\right]\Gamma^2_{\lambda\mu} \end{cases} \tag{11_16}$$

Armenian Transformation Relations of the Particle's Reflected Velocities

- *Using Armenian transformation equations of the particle's reflected coordinates given in (11_15) and (11_16), we obtain particle's reflected motion observed time differentials relations*

11_17

$$\begin{cases} \dfrac{dT_{\sigma\mu}}{dT_{\sigma\lambda}} = \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}\right)\Gamma_{\mu\lambda}^2 \\ \dfrac{dT_{\sigma\lambda}}{dT_{\sigma\mu}} = \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}\right)\Gamma_{\lambda\mu}^2 \end{cases}$$

- *Also using (11_15) and (11_16) we can also determine Armenian transformation relations for the particle's reflected velocities*

11_18

$$\begin{cases} \dfrac{U_{\sigma\mu}}{c} = \dfrac{\dfrac{U_{\sigma\lambda}}{c} - \dfrac{V_{\mu\lambda}}{c}}{1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}} \\ \dfrac{U_{\sigma\lambda}}{c} = \dfrac{\dfrac{U_{\sigma\mu}}{c} - \dfrac{V_{\lambda\mu}}{c}}{1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}} \end{cases}$$

- *And using the above Armenian transformation relations for the reflected velocities, we can determine the relative velocities expressed with the reflected velocities of the particle*

11_19

$$\begin{cases} \dfrac{V_{\lambda\mu}}{c} = \dfrac{\dfrac{U_{\sigma\mu}}{c} - \dfrac{U_{\sigma\lambda}}{c}}{1 + s\dfrac{U_{\sigma\lambda}}{c} + g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}} \\ \dfrac{V_{\mu\lambda}}{c} = \dfrac{\dfrac{U_{\sigma\lambda}}{c} - \dfrac{U_{\sigma\mu}}{c}}{1 + s\dfrac{U_{\sigma\mu}}{c} + g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}} \end{cases}$$

Armenian Relations Between The Reciprocal Accelerations

For a moment, let us ignore the fact that the observation systems in this volume are inertial and, as a purely mathematical problem, decide that the relative velocities are also a variable. 11_20

- *Let's use the following notations for different accelerations given in (2_09-11)*

$$\begin{cases} A_{\lambda\mu} = \dfrac{dV_{\lambda\mu}}{dT_{\lambda\mu}} \\ A_{\mu\lambda} = \dfrac{dV_{\mu\lambda}}{dT_{\mu\lambda}} \end{cases} \text{ and } \begin{cases} B_{\lambda\sigma} = \dfrac{dU_{\lambda\sigma}}{dT_{\lambda\sigma}} \\ B_{\sigma\lambda} = \dfrac{dU_{\sigma\lambda}}{dT_{\sigma\lambda}} \end{cases} \text{ and } \begin{cases} B_{\mu\sigma} = \dfrac{dU_{\mu\sigma}}{dT_{\mu\sigma}} \\ B_{\sigma\mu} = \dfrac{dU_{\sigma\mu}}{dT_{\sigma\mu}} \end{cases} \quad 11\_21$$

- *By differentiating Armenian transformation relations of the reciprocal relative velocities given in (8_08) respect to the corresponding reciprocally observed times, we will obtain Armenian transformation relations of the relative accelerations between systems (λ,μ)*

$$\begin{cases} A_{\lambda\mu} = -\dfrac{A_{\mu\lambda}}{\left(1+s\dfrac{V_{\mu\lambda}}{c}\right)^3} \\ A_{\mu\lambda} = -\dfrac{A_{\lambda\mu}}{\left(1+s\dfrac{V_{\lambda\mu}}{c}\right)^3} \end{cases} \quad 11\_22$$

- *By differentiating Armenian transformation relations of reciprocal velocities given in (8_11,12) by the respective reciprocal observed times, we will obtain the Armenian transformation relations for the reciprocal accelerations between systems (λ,σ) and (μ,σ)*

$$\begin{cases} B_{\lambda\sigma} = -\dfrac{B_{\sigma\lambda}}{\left(1+s\dfrac{U_{\sigma\lambda}}{c}\right)^3} \\ B_{\sigma\lambda} = -\dfrac{B_{\lambda\sigma}}{\left(1+s\dfrac{U_{\lambda\sigma}}{c}\right)^3} \end{cases} \text{ and } \begin{cases} B_{\mu\sigma} = -\dfrac{B_{\sigma\mu}}{\left(1+s\dfrac{U_{\sigma\mu}}{c}\right)^3} \\ B_{\sigma\mu} = -\dfrac{B_{\mu\sigma}}{\left(1+s\dfrac{U_{\mu\sigma}}{c}\right)^3} \end{cases} \quad 11\_23$$

Important Conclusions

11_24 From the results obtained in this chapter, it follows that the form (structure) of the Armenian transformation equations of the reflected coordinates of the particles coincide with the Armenian transformation equations of the direct coordinates of the particle. And Armenian transformation relations of the particle's reflected velocities also coincide with the Armenian transformation relations of the particle's direct velocities. Therefore, we can define the following method: in order that from the transformation equations of the particle's direct physical quantities to obtain the transformation equations of the particle's reflected physical quantities, it is necessary that in the transformation equations of the particle's direct physical quantities to make the permutation of the lower indexes by the following rules.

- *The lower indexes of all observed physical quantities permute as follows*

11_25

$$\begin{cases} (\lambda,\sigma) \;\Rightarrow\; (\sigma,\lambda) \\ (\mu,\sigma) \;\Rightarrow\; (\sigma,\mu) \end{cases}$$

- *And the lower indexes of all quantities characterizing the observing systems, such as relative velocities, relative accelerations and transformation coefficients, permute as follows*

11_26

$$\begin{cases} (\lambda,\mu) \;\Rightarrow\; (\mu,\lambda) \\ (\mu,\lambda) \;\Rightarrow\; (\lambda,\mu) \end{cases}$$

11_27

In front of Nation-Army military conference entrance
(April 22, 2017, Yerevan, Armenia)

Chapter 12

Definition of the Armenian Gamma Coefficients and Their Universal Transformation Equations

All the formulas presented in this chapter which are related to the reflected motion of the particle, we can also obtain from the corresponding formulas of the direct motion of the particle, by performing permutation law with the lower indexes of physical quantities indicated in (11_25) and (11_26).

Definition of the Armenian Gamma Coefficients of Transformation in the Case of Second Type of Transformation

➢ *In the case of inertial observing systems, definition and notations of the Armenian gamma coefficients for particle's coordinates transformation, expressed by relative velocities*

12_01

$$\begin{cases} \Gamma_{\lambda\mu} \;:=\; \Gamma_{\xi}(V_{\lambda\mu}) \;=\; \dfrac{1}{\sqrt{1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}^2}{c^2}}} \\[2ex] \Gamma_{\mu\lambda} \;:=\; \Gamma_{\xi}(V_{\mu\lambda}) \;=\; \dfrac{1}{\sqrt{1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}^2}{c^2}}} \end{cases}$$

➢ *In the boundary case, when the observation systems coincide with each other, the intrinsic (own) values of the Armenian gamma coefficients will be*

12_02

$$\Gamma_{\lambda\lambda} \;=\; \Gamma_{\mu\mu} \;=\; 1$$

➢ *Inserting the values of the second type transformations determinants given in (10_16) into the expressions of gamma2 coefficients given in (7_23) and also using the above definitions of the Armenian gamma coefficients, we obtain*

12_03

$$\begin{cases} \Gamma_{\lambda\mu}^2 \;=\; \Gamma_{\lambda\mu} \\ \Gamma_{\mu\lambda}^2 \;=\; \Gamma_{\mu\lambda} \end{cases}$$

12_04

I am the son of a big Armenian family who survived
the Armenian Genocide years 1915-1923
(April 22, 2017, Yerevan, Armenia)

Important Relations of the Armenian Gamma Coefficients

- *Relations between direct and inverse Armenian gamma coefficients*

$$\begin{cases} \Gamma_{\lambda\mu} = \left(1 + s\dfrac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda} \\ \Gamma_{\mu\lambda} = \left(1 + s\dfrac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu} \\ \dfrac{V_{\lambda\mu}}{c}\Gamma_{\lambda\mu} = -\dfrac{V_{\mu\lambda}}{c}\Gamma_{\mu\lambda} \end{cases}$$ 12_05

- *Relation which is associated with the Armenian energy properties, when reciprocal observed particles are located on the origins of the inertial systems* λ *and* μ

$$\left(1 + \tfrac{1}{2}s\frac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda} = \left(1 + \tfrac{1}{2}s\frac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu}$$ 12_06

- *Relation which is associated with the Armenian momentum properties, when reciprocal observed particles are located on the origins of the inertial systems* λ *and* μ

$$\left(\tfrac{1}{2}s + g\frac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu} + \left(\tfrac{1}{2}s + g\frac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda} = s\left(1 + \tfrac{1}{2}s\frac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu}$$ 12_07

- *Relations which is associated with the Armenian full energy derivation, when reciprocal observed particles are located on the origins of the inertial systems* λ *and* μ

$$\begin{cases} \left(\tfrac{1}{2}s + g\dfrac{V_{\lambda\mu}}{c}\right)^2 - s\left(\tfrac{1}{2}s + g\dfrac{V_{\lambda\mu}}{c}\right)\left(1 + \tfrac{1}{2}s\dfrac{V_{\lambda\mu}}{c}\right) + g\left(1 + \tfrac{1}{2}s\dfrac{V_{\lambda\mu}}{c}\right)^2 = \dfrac{g - \tfrac{1}{4}s^2}{(\Gamma_{\lambda\mu})^2} \\ \left(\tfrac{1}{2}s + g\dfrac{V_{\mu\lambda}}{c}\right)^2 - s\left(\tfrac{1}{2}s + g\dfrac{V_{\mu\lambda}}{c}\right)\left(1 + \tfrac{1}{2}s\dfrac{V_{\mu\lambda}}{c}\right) + g\left(1 + \tfrac{1}{2}s\dfrac{V_{\mu\lambda}}{c}\right)^2 = \dfrac{g - \tfrac{1}{4}s^2}{(\Gamma_{\mu\lambda})^2} \end{cases}$$ 12_08

Definition of a Particle's Gamma Coefficients When Observing The Motion of a Particle

- In the case when observing the direct motion of a particle, we can define the Armenian gamma coefficients expressed with the corresponding direct velocities of a particle

12_09

$$\begin{cases} \Gamma_{\lambda\sigma} = \Gamma_{\zeta}(U_{\lambda\sigma}) = \dfrac{1}{\sqrt{1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}^2}{c^2}}} \\ \Gamma_{\mu\sigma} = \Gamma_{\zeta}(U_{\mu\sigma}) = \dfrac{1}{\sqrt{1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\mu\sigma}^2}{c^2}}} \end{cases}$$

- In the case when observing the reflected motion of a particle, we can define the Armenian gamma coefficients expressed with the corresponding reflected velocities of a particle

12_10

$$\begin{cases} \Gamma_{\sigma\lambda} = \Gamma_{\zeta}(U_{\sigma\lambda}) = \dfrac{1}{\sqrt{1+s\dfrac{U_{\sigma\lambda}}{c}+g\dfrac{U_{\sigma\lambda}^2}{c^2}}} \\ \Gamma_{\sigma\mu} = \Gamma_{\zeta}(U_{\sigma\mu}) = \dfrac{1}{\sqrt{1+s\dfrac{U_{\sigma\mu}}{c}+g\dfrac{U_{\sigma\mu}^2}{c^2}}} \end{cases}$$

- In the boundary conditions, when the observed particle is located in one of the observing inertial systems, then the Armenian gamma coefficients of that particle will be

12_11

$$\Gamma_{\lambda\lambda} = \Gamma_{\mu\mu} = \Gamma_{\sigma\sigma} = 1$$

- The domains of determination of the particle's gamma coefficients will be

12_12

$$\begin{cases} 1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}^2}{c^2} > 0 \\ 1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\mu\sigma}^2}{c^2} > 0 \end{cases} \text{and} \begin{cases} 1+s\dfrac{U_{\sigma\lambda}}{c}+g\dfrac{U_{\sigma\lambda}^2}{c^2} > 0 \\ 1+s\dfrac{U_{\sigma\mu}}{c}+g\dfrac{U_{\sigma\mu}^2}{c^2} > 0 \end{cases}$$

The Particle's Armenian Gamma Coefficients Transformations

- *In the case of observation of the direct motion of the particle, using the Armenian transformation relations of the particle direct velocities given in (8_06), we obtain the particle's Armenian direct gamma coefficients transformations*

$$\begin{cases} \Gamma_{\lambda\sigma} = \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)\Gamma_{\mu\lambda}\Gamma_{\mu\sigma} \\ \Gamma_{\mu\sigma} = \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)\Gamma_{\lambda\mu}\Gamma_{\lambda\sigma} \end{cases} \qquad \text{12\_13}$$

- *In the case of observation of the reflected motion of the particle, using the Armenian transformation relations of the particle reflected velocities given in (11_18), we obtain the particle's Armenian reflected gamma coefficients transformations*

$$\begin{cases} \Gamma_{\sigma\lambda} = \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}\right)\Gamma_{\lambda\mu}\Gamma_{\sigma\mu} \\ \Gamma_{\sigma\mu} = \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}\right)\Gamma_{\mu\lambda}\Gamma_{\sigma\lambda} \end{cases} \qquad \text{12\_14}$$

- *In the case of reciprocal motion observation, using the Armenian transformation relations of relative velocities given in (8_07), for the transformation of the Armenian gamma coefficients we obtain the following transformations, expressed by the particle's direct velocities*

$$\begin{cases} \Gamma_{\lambda\mu} = \left(1 + s\dfrac{U_{\mu\sigma}}{c} + g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)\Gamma_{\lambda\sigma}\Gamma_{\mu\sigma} \\ \Gamma_{\mu\lambda} = \left(1 + s\dfrac{U_{\lambda\sigma}}{c} + g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)\Gamma_{\lambda\sigma}\Gamma_{\mu\sigma} \end{cases} \qquad \text{12\_15}$$

- *In the case of reciprocal motion observation, using the Armenian transformation relations of relative velocities given in (11_19), for the transformation of the Armenian gamma coefficients we obtain the following transformations, expressed by the particle's reflected velocities*

$$\begin{cases} \Gamma_{\lambda\mu} = \left(1 + s\dfrac{U_{\sigma\lambda}}{c} + g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\lambda}\Gamma_{\sigma\mu} \\ \Gamma_{\mu\lambda} = \left(1 + s\dfrac{U_{\sigma\mu}}{c} + g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\lambda}\Gamma_{\sigma\mu} \end{cases} \qquad \text{12\_16}$$

First Group of Important Relations Between the Particle's Direct and Reflected Armenian Gamma Coefficients

- *In the case of the observation particle motion with respect to λ inertial system, we obtain the following reciprocal relations between the particle's direct and reflected gamma coefficients*

12_17

$$\begin{cases} \Gamma_{\lambda\sigma} = \left(1 + s\dfrac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} \\ \Gamma_{\sigma\lambda} = \left(1 + s\dfrac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} \end{cases}$$

- *In the case of observation particle motion respect to μ inertial system, we obtain the following reciprocal relations between particle's direct and reflected gamma coefficients*

12_18

$$\begin{cases} \Gamma_{\mu\sigma} = \left(1 + s\dfrac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} \\ \Gamma_{\sigma\mu} = \left(1 + s\dfrac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} \end{cases}$$

- *The joint relations between Armenian gamma coefficients and corresponding velocities of the particle*

12_19

$$\begin{cases} \dfrac{U_{\lambda\sigma}}{c}\Gamma_{\lambda\sigma} = -\dfrac{U_{\sigma\lambda}}{c}\Gamma_{\sigma\lambda} \\ \dfrac{U_{\mu\sigma}}{c}\Gamma_{\mu\sigma} = -\dfrac{U_{\sigma\mu}}{c}\Gamma_{\sigma\mu} \end{cases}$$

12_20

My scientific workplace (October 14, 2018, Yerevan, Armenia)

Second Group of Important Relations Between the Particle's Direct and Reflected Armenian Gamma Coefficients

- *Relations which is associated with the σ particle's Armenian energy properties, when observing the particle's direct and reflected motion with respect to the inertial systems λ or μ*

$$\begin{cases} \left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} = \left(1+\frac{1}{2}s\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} \\ \left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} = \left(1+\frac{1}{2}s\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} \end{cases} \quad \text{12\_21}$$

- *Relations which is associated with the σ particle's Armenian momentum properties, when observing the particle's direct and reflected motion with respect to the inertial systems λ or μ*

$$\begin{cases} \left(\frac{1}{2}s+g\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} + \left(\frac{1}{2}s+g\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} = s\left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} \\ \left(\frac{1}{2}s+g\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} + \left(\frac{1}{2}s+g\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} = s\left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} \end{cases} \quad \text{12\_22}$$

- *Relations which is associated with the σ particle's Armenian full energy derivation, when observing the particle's direct and reflected motion with respect to the inertial system λ*

$$\begin{cases} \left(\frac{1}{2}s+g\frac{U_{\lambda\sigma}}{c}\right)^2 - s\left(\frac{1}{2}s+g\frac{U_{\lambda\sigma}}{c}\right)\left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right) + g\left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right)^2 = \dfrac{g-\frac{1}{4}s^2}{(\Gamma_{\lambda\sigma})^2} \\ \left(\frac{1}{2}s+g\frac{U_{\sigma\lambda}}{c}\right)^2 - s\left(\frac{1}{2}s+g\frac{U_{\sigma\lambda}}{c}\right)\left(1+\frac{1}{2}s\frac{U_{\sigma\lambda}}{c}\right) + g\left(1+\frac{1}{2}s\frac{U_{\sigma\lambda}}{c}\right)^2 = \dfrac{g-\frac{1}{4}s^2}{(\Gamma_{\sigma\lambda})^2} \end{cases} \quad \text{12\_23}$$

- *Relations which is associated with the σ particle's Armenian full energy derivation, when observing the particle's direct and reflected motion with respect to the inertial system μ*

$$\begin{cases} \left(\frac{1}{2}s+g\frac{U_{\mu\sigma}}{c}\right)^2 - s\left(\frac{1}{2}s+g\frac{U_{\mu\sigma}}{c}\right)\left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right) + g\left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right)^2 = \dfrac{g-\frac{1}{4}s^2}{(\Gamma_{\mu\sigma})^2} \\ \left(\frac{1}{2}s+g\frac{U_{\sigma\mu}}{c}\right)^2 - s\left(\frac{1}{2}s+g\frac{U_{\sigma\mu}}{c}\right)\left(1+\frac{1}{2}s\frac{U_{\sigma\mu}}{c}\right) + g\left(1+\frac{1}{2}s\frac{U_{\sigma\mu}}{c}\right)^2 = \dfrac{g-\frac{1}{4}s^2}{(\Gamma_{\sigma\mu})^2} \end{cases} \quad \text{12\_24}$$

Third Group of Important Relations Between the Particle's Direct and Reflected Armenian Gamma Coefficients

- *Relations associated with the particle's energy transformation equations when observing the direct motion of a particle with respect to the inertial systems* λ *and* μ

12_25

$$\begin{cases} \left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} = \left[\left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma}+\frac{V_{\mu\lambda}}{c}\left(\frac{1}{2}s+g\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma}\right]\Gamma_{\mu\lambda} \\ \left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} = \left[\left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma}+\frac{V_{\lambda\mu}}{c}\left(\frac{1}{2}s+g\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma}\right]\Gamma_{\lambda\mu} \end{cases}$$

- *Relations associated with the particle's energy transformation equations when observing the reflected motion of a particle with respect to the inertial systems* λ *and* μ

12_26

$$\begin{cases} \left(1+\frac{1}{2}s\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} = \left[\left(1+\frac{1}{2}s\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu}+\frac{V_{\lambda\mu}}{c}\left(\frac{1}{2}s+g\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu}\right]\Gamma_{\lambda\mu} \\ \left(1+\frac{1}{2}s\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} = \left[\left(1+\frac{1}{2}s\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda}+\frac{V_{\mu\lambda}}{c}\left(\frac{1}{2}s+g\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda}\right]\Gamma_{\mu\lambda} \end{cases}$$

- *Relations associated with the particle's momentum transformation equations when observing the direct motion of a particle with respect to the inertial systems* λ *and* μ

12_27

$$\begin{cases} \left(\frac{1}{2}s+g\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} = \left[\left(1+s\frac{V_{\mu\lambda}}{c}\right)\left(\frac{1}{2}s+g\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma}-g\frac{V_{\mu\lambda}}{c}\left(1+\frac{1}{2}s\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma}\right]\Gamma_{\mu\lambda} \\ \left(\frac{1}{2}s+g\frac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} = \left[\left(1+s\frac{V_{\lambda\mu}}{c}\right)\left(\frac{1}{2}s+g\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma}-g\frac{V_{\lambda\mu}}{c}\left(1+\frac{1}{2}s\frac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma}\right]\Gamma_{\lambda\mu} \end{cases}$$

- *Relations associated with the particle's momentum transformation equations when observing the reflected motion of a particle with respect to the inertial systems* λ *and* μ

12_28

$$\begin{cases} \left(\frac{1}{2}s+g\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} = \left[\left(1+s\frac{V_{\lambda\mu}}{c}\right)\left(\frac{1}{2}s+g\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu}-g\frac{V_{\lambda\mu}}{c}\left(1+\frac{1}{2}s\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu}\right]\Gamma_{\lambda\mu} \\ \left(\frac{1}{2}s+g\frac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} = \left[\left(1+s\frac{V_{\mu\lambda}}{c}\right)\left(\frac{1}{2}s+g\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda}-g\frac{V_{\mu\lambda}}{c}\left(1+\frac{1}{2}s\frac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda}\right]\Gamma_{\mu\lambda} \end{cases}$$

In the Case of the Second Type of Transformation, the Universal Equations of the Armenian Transformation

- *When observing the direct motion of a particle with respect to the inertial systems λ and μ, then the Armenian direct transformation universal equations of the coordinates will be*

$$\begin{cases} cdT_{\mu\sigma} = \left[\left(1+s\frac{V_{\lambda\mu}}{c}\right)(cdT_{\lambda\sigma})+\left(g\frac{V_{\lambda\mu}}{c}\right)dX_{\lambda\sigma}\right]\Gamma_{\lambda\mu} \\ dX_{\mu\sigma} = \left[dX_{\lambda\sigma}-\frac{V_{\lambda\mu}}{c}(cdT_{\lambda\sigma})\right]\Gamma_{\lambda\mu} \end{cases} \quad 12\_29$$

- *When observing the direct motion of a particle with respect to the inertial systems λ and μ, then the Armenian inverse transformation universal equations of the coordinates will be*

$$\begin{cases} cdT_{\lambda\sigma} = \left[\left(1+s\frac{V_{\mu\lambda}}{c}\right)(cdT_{\mu\sigma})+\left(g\frac{V_{\mu\lambda}}{c}\right)dX_{\mu\sigma}\right]\Gamma_{\mu\lambda} \\ dX_{\lambda\sigma} = \left[dX_{\mu\sigma}-\frac{V_{\mu\lambda}}{c}(cdT_{\mu\sigma})\right]\Gamma_{\mu\lambda} \end{cases} \quad 12\_30$$

- *When observing the reflected motion of a particle with respect to the inertial systems λ and μ, then the Armenian direct transformation universal equations of the coordinates will be*

$$\begin{cases} cdT_{\sigma\mu} = \left[\left(1+s\frac{V_{\mu\lambda}}{c}\right)(cdT_{\sigma\lambda})+\left(g\frac{V_{\mu\lambda}}{c}\right)dX_{\sigma\lambda}\right]\Gamma_{\mu\lambda} \\ dX_{\sigma\mu} = \left[dX_{\sigma\lambda}-\frac{V_{\mu\lambda}}{c}(cdT_{\sigma\lambda})\right]\Gamma_{\mu\lambda} \end{cases} \quad 12\_31$$

- *When observing the reflected motion of a particle with respect to the inertial systems λ and μ, then the Armenian inverse transformation universal equations of the coordinates will be*

$$\begin{cases} cdT_{\sigma\lambda} = \left[\left(1+s\frac{V_{\lambda\mu}}{c}\right)(cdT_{\sigma\mu})+\left(g\frac{V_{\lambda\mu}}{c}\right)dX_{\sigma\mu}\right]\Gamma_{\lambda\mu} \\ dX_{\sigma\lambda} = \left[dX_{\sigma\mu}-\frac{V_{\lambda\mu}}{c}(cdT_{\sigma\mu})\right]\Gamma_{\lambda\mu} \end{cases} \quad 12\_32$$

In the Case of the Second Type of Transformations the Universal Equations of the Armenian Transformation Expressed by Appropriate Reciprocal Relative Velocities

- *When observing the direct motion of a particle with respect to the inertial systems λ and μ, then the Armenian direct transformation universal equations of the coordinates will be*

12_33

$$\begin{cases} cdT_{\mu\sigma} = \left[cdT_{\lambda\sigma} - \left(g\dfrac{V_{\mu\lambda}}{c} \right) dX_{\lambda\sigma} \right] \Gamma_{\mu\lambda} \\ dX_{\mu\sigma} = \left[\left(1 + s\dfrac{V_{\mu\lambda}}{c} \right) dX_{\lambda\sigma} + \dfrac{V_{\mu\lambda}}{c} (cdT_{\lambda\sigma}) \right] \Gamma_{\mu\lambda} \end{cases}$$

- *When observing the direct motion of a particle with respect to the inertial systems λ and μ, then the Armenian inverse transformation universal equations of the coordinates will be*

12_34

$$\begin{cases} cdT_{\lambda\sigma} = \left[cdT_{\mu\sigma} - \left(g\dfrac{V_{\lambda\mu}}{c} \right) dX_{\mu\sigma} \right] \Gamma_{\lambda\mu} \\ dX_{\lambda\sigma} = \left[\left(1 + s\dfrac{V_{\lambda\mu}}{c} \right) dX_{\mu\sigma} + \dfrac{V_{\lambda\mu}}{c} (cdT_{\mu\sigma}) \right] \Gamma_{\lambda\mu} \end{cases}$$

- *When observing the reflected motion of a particle with respect to the inertial systems λ and μ, then the Armenian direct transformation universal equations of the coordinates will be*

12_35

$$\begin{cases} cdT_{\sigma\mu} = \left[cdT_{\sigma\lambda} - \left(g\dfrac{V_{\lambda\mu}}{c} \right) dX_{\sigma\lambda} \right] \Gamma_{\lambda\mu} \\ dX_{\sigma\mu} = \left[\left(1 + s\dfrac{V_{\lambda\mu}}{c} \right) dX_{\sigma\lambda} + \dfrac{V_{\lambda\mu}}{c} (cdT_{\sigma\lambda}) \right] \Gamma_{\lambda\mu} \end{cases}$$

- *When observing the reflected motion of a particle with respect to the inertial systems λ and μ, then the Armenian inverse transformation universal equations of the coordinates will be*

12_36

$$\begin{cases} cdT_{\sigma\lambda} = \left[cdT_{\sigma\mu} - \left(g\dfrac{V_{\mu\lambda}}{c} \right) dX_{\sigma\mu} \right] \Gamma_{\mu\lambda} \\ dX_{\sigma\lambda} = \left[\left(1 + s\dfrac{V_{\mu\lambda}}{c} \right) dX_{\sigma\mu} + \dfrac{V_{\mu\lambda}}{c} (cdT_{\sigma\mu}) \right] \Gamma_{\mu\lambda} \end{cases}$$

Chapter 13

Introduction to the Absolute Time Concept

In this third volume of our research work we discuss the case of inertial observation systems. But for a moment let's put aside the requirement of inertiality of the observation systems and solve them as a purely mathematical problem, recognizing that relative velocities are also variable quantities, so that we can experience all the beauty and charm of the derived formulas. Of course, afterwards, we will remember that in this third volume of our research work the relative velocities are constant quantities, and therefore with all the consequences that follow from it, for example equating the relative accelerations in all derived equations and relations to zero.

Definition of the Infinitesimal Armenian Interval Expressions In the Case of the Particle's Reflected Motion Observation

- *In the case of a particle's reflected motion observation, we define the quadratic expressions of the infinitesimal Armenian intervals, which, due to the causal relation, should be positive values*

13_01

$$\begin{cases} (d\mathit{t}_{\sigma\lambda})^2 = (cdT_{\sigma\lambda})^2 + s(cdT_{\sigma\lambda})dX_{\sigma\lambda} + g(dX_{\sigma\lambda})^2 > 0 \\ (d\mathit{t}_{\sigma\mu})^2 = (cdT_{\sigma\mu})^2 + s(cdT_{\sigma\mu})dX_{\sigma\mu} + g(dX_{\sigma\mu})^2 > 0 \end{cases}$$

- *The above-mentioned quadratic expressions of the infinitesimal Armenian intervals can also be represented by the observed particle's reflected velocities*

13_02

$$\begin{cases} (d\mathit{t}_{\sigma\lambda})^2 = \left(1 + s\dfrac{U_{\sigma\lambda}}{c} + g\dfrac{U_{\sigma\lambda}^2}{c^2}\right)(cdT_{\sigma\lambda})^2 > 0 \\ (d\mathit{t}_{\sigma\mu})^2 = \left(1 + s\dfrac{U_{\sigma\mu}}{c} + g\dfrac{U_{\sigma\mu}^2}{c^2}\right)(cdT_{\sigma\mu})^2 > 0 \end{cases}$$

- *From the above quadratic expressions of the infinitesimal Armenian intervals follows the domains of determination of the infinitesimal Armenian intervals, which is already given in (12_12)*

13_03

$$\begin{cases} 1 + s\dfrac{U_{\sigma\lambda}}{c} + g\dfrac{U_{\sigma\lambda}^2}{c^2} > 0 \\ 1 + s\dfrac{U_{\sigma\mu}}{c} + g\dfrac{U_{\sigma\mu}^2}{c^2} > 0 \end{cases}$$

- *When observing the reflected motion of a particle, let us calculate the quadratic expressions of the infinitesimal Armenian intervals under the boundary conditions when* $\lambda = \sigma$ *and* $\mu = \sigma$

13_04

$$\begin{cases} \lambda = \sigma \rightarrow (d\mathit{t}_{\sigma\sigma})^2 = (cdT_{\sigma\sigma})^2 + s(cdT_{\sigma\sigma})dX_{\sigma\sigma} + g(dX_{\sigma\sigma})^2 = (cd\tau_{\sigma})^2 \\ \mu = \sigma \rightarrow (d\mathit{t}_{\sigma\sigma})^2 = (cdT_{\sigma\sigma})^2 + s(cdT_{\sigma\sigma})dX_{\sigma\sigma} + g(dX_{\sigma\sigma})^2 = (cd\tau_{\sigma})^2 \end{cases}$$

Applying the First Axiom of the Armenian Theory of Time – Space When Observing the Particle's Reflected Motion

➢ *When observing the particle's reflected motion, then according to the first axiom and similar to (10_06), the square of the infinitesimal Armenian intervals must be equal to each other*

$$\begin{cases} (d\text{Ե}_{\text{չ}})^2 = (d\text{Ե}_{\lambda\sigma})^2 = (d\text{Ե}_{\sigma\lambda})^2 \\ (d\text{Ե}_{\text{չ}})^2 = (d\text{Ե}_{\mu\sigma})^2 = (d\text{Ե}_{\sigma\mu})^2 \end{cases} \qquad (13\_05)$$

➢ *In the boundary case wen $\lambda = \sigma$ or $\mu = \sigma$ and similar to (10_23), the above squares of the infinitesimal Armenian intervals must also satisfy the following relations*

$$(d\text{Ե}_{\text{չ}})^2 = (d\text{Ե}_{\sigma\lambda})^2 = (d\text{Ե}_{\sigma\mu})^2 = (cd\tau_\sigma)^2 \qquad (13\_06)$$

➢ *Adding the above new expressions of the square of the infinitesimal invariant Armenian interval given in (10_24), we can also represent it figuratively in the following way*

$$\begin{cases} (d\text{Ե}_{\text{չ}})^2 = (d\text{Ե}_{\lambda\mu})^2 = (d\text{Ե}_{\lambda\sigma})^2 = (d\text{Ե}_{\mu\sigma})^2 = (cd\tau_\sigma)^2 \\ \qquad\qquad\quad \| \qquad\qquad\quad \| \qquad\qquad\quad \| \qquad\qquad\quad \| \\ (d\text{Ե}_{\text{չ}})^2 = (d\text{Ե}_{\mu\lambda})^2 = (d\text{Ե}_{\sigma\lambda})^2 = (d\text{Ե}_{\sigma\mu})^2 = (cd\tau_\sigma)^2 \end{cases} \qquad (13\_07)$$

➢ *Using the above figurative form of the infinitesimal invariant Armenian interval, we can write two parallel equations of a moving particle with corresponding particle velocities as follows*

$$\begin{cases} \left(1 + s\dfrac{U_{\lambda\sigma}}{c} + g\dfrac{U_{\lambda\sigma}^2}{c^2}\right)(cdT_{\lambda\sigma})^2 = \left(1 + s\dfrac{U_{\mu\sigma}}{c} + g\dfrac{U_{\mu\sigma}^2}{c^2}\right)(cdT_{\mu\sigma})^2 = (cd\tau_\sigma)^2 \\ \left(1 + s\dfrac{U_{\sigma\lambda}}{c} + g\dfrac{U_{\sigma\lambda}^2}{c^2}\right)(cdT_{\sigma\lambda})^2 = \left(1 + s\dfrac{U_{\sigma\mu}}{c} + g\dfrac{U_{\sigma\mu}^2}{c^2}\right)(cdT_{\sigma\mu})^2 = (cd\tau_\sigma)^2 \end{cases} \qquad (13\_08)$$

Introducing the Concept of Absolute Time

- The corresponding of the Armenian gamma coefficients inserted into the relations given by (10_25) and the second equation of (13_08), we obtain the following relations

13_09

$$\begin{cases} d\tau_{\lambda} = \dfrac{dT_{\lambda\sigma}}{\Gamma_{\lambda\sigma}} = \dfrac{dT_{\lambda\mu}}{\Gamma_{\lambda\mu}} \\ d\tau_{\mu} = \dfrac{dT_{\mu\sigma}}{\Gamma_{\mu\sigma}} = \dfrac{dT_{\mu\lambda}}{\Gamma_{\mu\lambda}} \\ d\tau_{\sigma} = \dfrac{dT_{\sigma\lambda}}{\Gamma_{\sigma\lambda}} = \dfrac{dT_{\sigma\mu}}{\Gamma_{\sigma\mu}} \end{cases}$$

- Taking into account that, according to (10_24) and (13_07), the square of the infinitesimal Armenian invariant interval is the same for all observing and observed systems, we can therefore define and denote the concept of infinitesimal absolute time as follows

13_10

$$d\tau = \frac{1}{c}(d\text{Ե}_{\text{չ}}) = d\tau_{\lambda} = d\tau_{\mu} = d\tau_{\sigma}$$

- Therefore we can write relations (13_09) by the new introduced absolute time as follows

13_11

$$\begin{cases} d\tau = \dfrac{dT_{\lambda\sigma}}{\Gamma_{\lambda\sigma}} = \dfrac{dT_{\lambda\mu}}{\Gamma_{\lambda\mu}} \\ d\tau = \dfrac{dT_{\mu\sigma}}{\Gamma_{\mu\sigma}} = \dfrac{dT_{\mu\lambda}}{\Gamma_{\mu\lambda}} \\ d\tau = \dfrac{dT_{\sigma\lambda}}{\Gamma_{\sigma\lambda}} = \dfrac{dT_{\sigma\mu}}{\Gamma_{\sigma\mu}} \end{cases}$$

- From the above we obtain the relations between observed and absolute time differentials

13_12

$$\begin{cases} \dfrac{dT_{\lambda\mu}}{d\tau} = \Gamma_{\lambda\mu} \\ \dfrac{dT_{\mu\lambda}}{d\tau} = \Gamma_{\mu\lambda} \end{cases} \quad \text{և} \quad \begin{cases} \dfrac{dT_{\lambda\sigma}}{d\tau} = \Gamma_{\lambda\sigma} \\ \dfrac{dT_{\mu\sigma}}{d\tau} = \Gamma_{\mu\sigma} \end{cases} \quad \text{և} \quad \begin{cases} \dfrac{dT_{\sigma\lambda}}{d\tau} = \Gamma_{\sigma\lambda} \\ \dfrac{dT_{\sigma\mu}}{d\tau} = \Gamma_{\sigma\mu} \end{cases}$$

The Derivation of Velocities With Respect to Absolute Time

- *The derivatives of the relative velocities by absolute time, according to the notations of relative accelerations given in (2_09) and relations given in (13_12), we will have the following formulas*

$$\begin{cases} \dfrac{dV_{\lambda\mu}}{d\tau} = \Gamma_{\lambda\mu} A_{\lambda\mu} \\ \dfrac{dV_{\mu\lambda}}{d\tau} = \Gamma_{\mu\lambda} A_{\mu\lambda} \end{cases} \tag{13_13}$$

- *The derivatives of the particle velocities by absolute time, according to the notations given in (2_10,11) and relations given in (13_12), will have the following formulas*

$$\begin{cases} \dfrac{dU_{\lambda\sigma}}{d\tau} = \Gamma_{\lambda\sigma} B_{\lambda\sigma} \\ \dfrac{dU_{\mu\sigma}}{d\tau} = \Gamma_{\mu\sigma} B_{\mu\sigma} \end{cases} \quad \text{և} \quad \begin{cases} \dfrac{dU_{\sigma\lambda}}{d\tau} = \Gamma_{\sigma\lambda} B_{\sigma\lambda} \\ \dfrac{dU_{\sigma\mu}}{d\tau} = \Gamma_{\sigma\mu} B_{\sigma\mu} \end{cases} \tag{13_14}$$

In this way, we can deal with any physical quantity, if its derivative makes sense in accordance with the corresponding observation time or in absolute time. 13_15

While working on the third volume of our research work
(January 17, 2019, Yerevan, Armenia) 13_16

Chapter 14

Transformations of Accelerations of the Direct and Reflected Moving Particle

In this chapter, we will also for a moment put aside the requirement that the observation systems must be inertial and derive the accelerations transformation formulas as a purely mathematical problem, recognizing that relative velocities are also variable quantities, and doing so we can experience all the beauty and charm of the formulas we derive.

The Derivatives of the Velocity Transformation Formulas by Absolute Time in the Case of Observation of the Direct Motion of a Particle

- *Taking the derivative of the first formula of the direct particle velocity transformations given in (8_06), with respect to absolute time, we will obtain*

$$\frac{dU_{\mu\sigma}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}^2}{c^2}}}{1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}} \right)^2 \frac{dU_{\lambda\sigma}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\lambda\sigma}}{c} + g\frac{U_{\lambda\sigma}^2}{c^2}}}{1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}} \right)^2 \frac{dV_{\lambda\mu}}{d\tau} \tag{14_01}$$

- *Taking the derivative of the second formula of the direct particle velocity transformations given in (8_06), with respect to absolute time, we will obtain*

$$\frac{dU_{\lambda\sigma}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}^2}{c^2}}}{1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}} \right)^2 \frac{dU_{\mu\sigma}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\mu\sigma}}{c} + g\frac{U_{\mu\sigma}^2}{c^2}}}{1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}} \right)^2 \frac{dV_{\mu\lambda}}{d\tau} \tag{14_02}$$

- *Taking the derivative of the first formula of the direct particle velocity transformations given in (8_07), with respect to absolute time, we will obtain*

$$\frac{dV_{\lambda\mu}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{U_{\mu\sigma}}{c} + g\frac{U_{\mu\sigma}^2}{c^2}}}{1 + s\frac{U_{\mu\sigma}}{c} + g\frac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}} \right)^2 \frac{dU_{\lambda\sigma}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\lambda\sigma}}{c} + g\frac{U_{\lambda\sigma}^2}{c^2}}}{1 + s\frac{U_{\mu\sigma}}{c} + g\frac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}} \right)^2 \frac{dU_{\mu\sigma}}{d\tau} \tag{14_03}$$

- *Taking the derivative of the second formula of the direct particle velocity transformations given in (8_07), with respect to absolute time, we will obtain*

$$\frac{dV_{\mu\lambda}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{U_{\lambda\sigma}}{c} + g\frac{U_{\lambda\sigma}^2}{c^2}}}{1 + s\frac{U_{\lambda\sigma}}{c} + g\frac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}} \right)^2 \frac{dU_{\mu\sigma}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\mu\sigma}}{c} + g\frac{U_{\mu\sigma}^2}{c^2}}}{1 + s\frac{U_{\lambda\sigma}}{c} + g\frac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}} \right)^2 \frac{dU_{\lambda\sigma}}{d\tau} \tag{14_04}$$

The Derivatives of the Velocity Transformation Formulas by Absolute Time in the Case of Observation of the Reflected Motion of a Particle

➢ *Taking the derivative of the first formula of the reflected particle velocity transformations given in (11_18), with respect to absolute time, we will obtain*

14_05
$$\frac{dU_{\sigma\mu}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}^2}{c^2}}}{1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}} \right)^2 \frac{dU_{\sigma\lambda}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\sigma\lambda}}{c} + g\frac{U_{\sigma\lambda}^2}{c^2}}}{1 + s\frac{V_{\mu\lambda}}{c} + g\frac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}} \right)^2 \frac{dV_{\mu\lambda}}{d\tau}$$

➢ *Taking the derivative of the second formula of the reflected particle velocity transformations given in (11_18), with respect to absolute time, we will obtain*

14_06
$$\frac{dU_{\sigma\lambda}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}^2}{c^2}}}{1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}} \right)^2 \frac{dU_{\sigma\mu}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\sigma\mu}}{c} + g\frac{U_{\sigma\mu}^2}{c^2}}}{1 + s\frac{V_{\lambda\mu}}{c} + g\frac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}} \right)^2 \frac{dV_{\lambda\mu}}{d\tau}$$

➢ *Taking the derivative of the first formula of the reflected particle velocity transformations given in (11_19), with respect to absolute time, we will obtain*

14_07
$$\frac{dV_{\lambda\mu}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{U_{\sigma\lambda}}{c} + g\frac{U_{\sigma\lambda}^2}{c^2}}}{1 + s\frac{U_{\sigma\lambda}}{c} + g\frac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}} \right)^2 \frac{dU_{\sigma\mu}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\sigma\mu}}{c} + g\frac{U_{\sigma\mu}^2}{c^2}}}{1 + s\frac{U_{\sigma\lambda}}{c} + g\frac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}} \right)^2 \frac{dU_{\sigma\lambda}}{d\tau}$$

➢ *Taking the derivative of the second formula of the reflected particle velocity transformations given in (11_19), with respect to absolute time, we will obtain*

14_08
$$\frac{dV_{\mu\lambda}}{d\tau} = \left(\frac{\sqrt{1 + s\frac{U_{\sigma\mu}}{c} + g\frac{U_{\sigma\mu}^2}{c^2}}}{1 + s\frac{U_{\sigma\mu}}{c} + g\frac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}} \right)^2 \frac{dU_{\sigma\lambda}}{d\tau} - \left(\frac{\sqrt{1 + s\frac{U_{\sigma\lambda}}{c} + g\frac{U_{\sigma\lambda}^2}{c^2}}}{1 + s\frac{U_{\sigma\mu}}{c} + g\frac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}} \right)^2 \frac{dU_{\sigma\mu}}{d\tau}$$

In the Case of Observation of the Direct Motion of the Particle, the Derivatives of the Armenian Transformation Formulas of Velocities are Expressed by the Armenian Gamma Coefficients

- *The particle velocity derivative expression given in (14_01) is represented by the corresponding Armenian gamma coefficients given in (12_01) and (12_09)*

$$\frac{dU_{\mu\sigma}}{d\tau} = \frac{\dfrac{dU_{\lambda\sigma}}{d\tau}}{(\Gamma_{\lambda\mu})^2\left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)^2} - \frac{\dfrac{dV_{\lambda\mu}}{d\tau}}{(\Gamma_{\lambda\sigma})^2\left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)^2} \qquad \text{14\_09}$$

- *The particle velocity derivative expression given in (14_02) is represented by the corresponding Armenian gamma coefficients given in (12_01) and (12_09)*

$$\frac{dU_{\lambda\sigma}}{d\tau} = \frac{\dfrac{dU_{\mu\sigma}}{d\tau}}{(\Gamma_{\mu\lambda})^2\left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)^2} - \frac{\dfrac{dV_{\mu\lambda}}{d\tau}}{(\Gamma_{\mu\sigma})^2\left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)^2} \qquad \text{14\_10}$$

- *The relative velocity derivative expression given in (14_03) is represented by the corresponding Armenian gamma coefficients given in (12_09)*

$$\frac{dV_{\lambda\mu}}{d\tau} = \frac{\dfrac{dU_{\lambda\sigma}}{d\tau}}{(\Gamma_{\mu\sigma})^2\left(1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)^2} - \frac{\dfrac{dU_{\mu\sigma}}{d\tau}}{(\Gamma_{\lambda\sigma})^2\left(1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)^2} \qquad \text{14\_11}$$

- *The relative velocity derivative expression given in (14_04) is represented by the corresponding Armenian gamma coefficients given in (12_09)*

$$\frac{dV_{\mu\lambda}}{d\tau} = \frac{\dfrac{dU_{\mu\sigma}}{d\tau}}{(\Gamma_{\lambda\sigma})^2\left(1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)^2} - \frac{\dfrac{dU_{\lambda\sigma}}{d\tau}}{(\Gamma_{\mu\sigma})^2\left(1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)^2} \qquad \text{14\_12}$$

In the Case of Observation of the Reflected Motion of the Particle, the Derivatives of the Armenian Transformation Formulas of Velocities are Expressed by the Armenian Gamma Coefficients

- *The particle velocity derivative expression given in (14_05) is represented by the corresponding Armenian gamma coefficients given in (12_01) and (12_10)*

14_13

$$\frac{dU_{\sigma\mu}}{d\tau} = \frac{\dfrac{dU_{\sigma\lambda}}{d\tau}}{(\Gamma_{\mu\lambda})^2\left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}\right)^2} - \frac{\dfrac{dV_{\mu\lambda}}{d\tau}}{(\Gamma_{\sigma\lambda})^2\left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}\right)^2}$$

- *The particle velocity derivative expression given in (14_06) is represented by the corresponding Armenian gamma coefficients given in (12_01) and (12_10)*

14_14

$$\frac{dU_{\sigma\lambda}}{d\tau} = \frac{\dfrac{dU_{\sigma\mu}}{d\tau}}{(\Gamma_{\lambda\mu})^2\left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}\right)^2} - \frac{\dfrac{dV_{\lambda\mu}}{d\tau}}{(\Gamma_{\sigma\mu})^2\left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}\right)^2}$$

- *The relative velocity derivative expression given in (14_07) is represented by the corresponding Armenian gamma coefficients given in (12_10)*

14_15

$$\frac{dV_{\lambda\mu}}{d\tau} = \frac{\dfrac{dU_{\sigma\mu}}{d\tau}}{(\Gamma_{\sigma\lambda})^2\left(1+s\dfrac{U_{\sigma\lambda}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)^2} - \frac{\dfrac{dU_{\sigma\lambda}}{d\tau}}{(\Gamma_{\sigma\mu})^2\left(1+s\dfrac{U_{\sigma\lambda}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)^2}$$

- *The relative velocity derivative expression given in (14_08) is represented by the corresponding Armenian gamma coefficients given in (12_10)*

14_16

$$\frac{dV_{\mu\lambda}}{d\tau} = \frac{\dfrac{dU_{\sigma\lambda}}{d\tau}}{(\Gamma_{\sigma\mu})^2\left(1+s\dfrac{U_{\sigma\mu}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)^2} - \frac{\dfrac{dU_{\sigma\mu}}{d\tau}}{(\Gamma_{\sigma\lambda})^2\left(1+s\dfrac{U_{\sigma\mu}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)^2}$$

Useful Relations From the Chapter 12, Which We Need to Use

- *The transformation relations of the Armenian gamma coefficients given in (12_13) can be written in two ways as follows*

$$\left\{\begin{array}{l}\left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)\Gamma_{\lambda\mu} = \dfrac{\Gamma_{\mu\sigma}}{\Gamma_{\lambda\sigma}}\\ \left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)\Gamma_{\lambda\sigma} = \dfrac{\Gamma_{\mu\sigma}}{\Gamma_{\lambda\mu}}\end{array}\right. \text{ and } \left\{\begin{array}{l}\left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)\Gamma_{\mu\lambda} = \dfrac{\Gamma_{\lambda\sigma}}{\Gamma_{\mu\sigma}}\\ \left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)\Gamma_{\mu\sigma} = \dfrac{\Gamma_{\lambda\sigma}}{\Gamma_{\mu\lambda}}\end{array}\right. \quad 14\_17$$

- *The transformation relations of the Armenian gamma coefficients given in (12_14) can be written in two ways as follows*

$$\left\{\begin{array}{l}\left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}\right)\Gamma_{\lambda\mu} = \dfrac{\Gamma_{\sigma\lambda}}{\Gamma_{\sigma\mu}}\\ \left(1+s\dfrac{V_{\lambda\mu}}{c}+g\dfrac{V_{\lambda\mu}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\mu} = \dfrac{\Gamma_{\sigma\lambda}}{\Gamma_{\lambda\mu}}\end{array}\right. \text{ and } \left\{\begin{array}{l}\left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}\right)\Gamma_{\mu\lambda} = \dfrac{\Gamma_{\sigma\mu}}{\Gamma_{\sigma\lambda}}\\ \left(1+s\dfrac{V_{\mu\lambda}}{c}+g\dfrac{V_{\mu\lambda}U_{\sigma\lambda}}{c^2}\right)\Gamma_{\sigma\lambda} = \dfrac{\Gamma_{\sigma\mu}}{\Gamma_{\mu\lambda}}\end{array}\right. \quad 14\_18$$

- *The transformation relations of the Armenian gamma coefficients given in (12_15) can be written in two ways as follows*

$$\left\{\begin{array}{l}\left(1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)\Gamma_{\lambda\sigma} = \dfrac{\Gamma_{\mu\lambda}}{\Gamma_{\mu\sigma}}\\ \left(1+s\dfrac{U_{\lambda\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)\Gamma_{\mu\sigma} = \dfrac{\Gamma_{\mu\lambda}}{\Gamma_{\lambda\sigma}}\end{array}\right. \text{ and } \left\{\begin{array}{l}\left(1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)\Gamma_{\lambda\sigma} = \dfrac{\Gamma_{\lambda\mu}}{\Gamma_{\mu\sigma}}\\ \left(1+s\dfrac{U_{\mu\sigma}}{c}+g\dfrac{U_{\lambda\sigma}U_{\mu\sigma}}{c^2}\right)\Gamma_{\mu\sigma} = \dfrac{\Gamma_{\lambda\mu}}{\Gamma_{\lambda\sigma}}\end{array}\right. \quad 14\_19$$

- *The transformation relations of the Armenian gamma coefficients given in (12_16) can be written in two ways as follows*

$$\left\{\begin{array}{l}\left(1+s\dfrac{U_{\sigma\lambda}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\lambda} = \dfrac{\Gamma_{\lambda\mu}}{\Gamma_{\sigma\mu}}\\ \left(1+s\dfrac{U_{\sigma\lambda}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\mu} = \dfrac{\Gamma_{\lambda\mu}}{\Gamma_{\sigma\lambda}}\end{array}\right. \text{ and } \left\{\begin{array}{l}\left(1+s\dfrac{U_{\sigma\mu}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\lambda} = \dfrac{\Gamma_{\mu\lambda}}{\Gamma_{\sigma\mu}}\\ \left(1+s\dfrac{U_{\sigma\mu}}{c}+g\dfrac{U_{\sigma\lambda}U_{\sigma\mu}}{c^2}\right)\Gamma_{\sigma\mu} = \dfrac{\Gamma_{\mu\lambda}}{\Gamma_{\sigma\lambda}}\end{array}\right. \quad 14\_20$$

By Applying the Above Mentioned Useful Relations Into the Expressions Given by (14_09-16), We Can Write Them as Follows

➢ *When observing the direct motion of a particle, then inserting the useful relations given in (14_17,19) into the relations given in (14_09-12), we will obtain the following relations*

14_21

$$\begin{cases} (\Gamma_{\lambda\sigma})^2 \dfrac{dU_{\lambda\sigma}}{d\tau} = (\Gamma_{\mu\sigma})^2 \dfrac{dU_{\mu\sigma}}{d\tau} - (\Gamma_{\mu\lambda})^2 \dfrac{dV_{\mu\lambda}}{d\tau} \\ (\Gamma_{\mu\sigma})^2 \dfrac{dU_{\mu\sigma}}{d\tau} = (\Gamma_{\lambda\sigma})^2 \dfrac{dU_{\lambda\sigma}}{d\tau} - (\Gamma_{\lambda\mu})^2 \dfrac{dV_{\lambda\mu}}{d\tau} \\ (\Gamma_{\lambda\mu})^2 \dfrac{dV_{\lambda\mu}}{d\tau} = (\Gamma_{\lambda\sigma})^2 \dfrac{dU_{\lambda\sigma}}{d\tau} - (\Gamma_{\mu\sigma})^2 \dfrac{dU_{\mu\sigma}}{d\tau} \\ (\Gamma_{\mu\lambda})^2 \dfrac{dV_{\mu\lambda}}{d\tau} = (\Gamma_{\mu\sigma})^2 \dfrac{dU_{\mu\sigma}}{d\tau} - (\Gamma_{\lambda\sigma})^2 \dfrac{dU_{\lambda\sigma}}{d\tau} \end{cases}$$

➢ *When observing the reflected motion of a particle, then inserting the useful relations given in (14_18,20) into the relations given in (14_13-16), we will obtain the following relations*

14_22

$$\begin{cases} (\Gamma_{\sigma\lambda})^2 \dfrac{dU_{\sigma\lambda}}{d\tau} = (\Gamma_{\sigma\mu})^2 \dfrac{dU_{\sigma\mu}}{d\tau} - (\Gamma_{\lambda\mu})^2 \dfrac{dV_{\lambda\mu}}{d\tau} \\ (\Gamma_{\sigma\mu})^2 \dfrac{dU_{\sigma\mu}}{d\tau} = (\Gamma_{\sigma\lambda})^2 \dfrac{dU_{\sigma\lambda}}{d\tau} - (\Gamma_{\mu\lambda})^2 \dfrac{dV_{\mu\lambda}}{d\tau} \\ (\Gamma_{\mu\lambda})^2 \dfrac{dV_{\mu\lambda}}{d\tau} = (\Gamma_{\sigma\lambda})^2 \dfrac{dU_{\sigma\lambda}}{d\tau} - (\Gamma_{\sigma\mu})^2 \dfrac{dU_{\sigma\mu}}{d\tau} \\ (\Gamma_{\lambda\mu})^2 \dfrac{dV_{\lambda\mu}}{d\tau} = (\Gamma_{\sigma\mu})^2 \dfrac{dU_{\sigma\mu}}{d\tau} - (\Gamma_{\sigma\lambda})^2 \dfrac{dU_{\sigma\lambda}}{d\tau} \end{cases}$$

➢ *Using the last two equations of the above systems of relations and summing each other, we obtain the following important relation between the derivatives of relative velocities*

14_23

$$(\Gamma_{\lambda\mu})^2 \frac{dV_{\lambda\mu}}{d\tau} + (\Gamma_{\mu\lambda})^2 \frac{dV_{\mu\lambda}}{d\tau} = 0$$

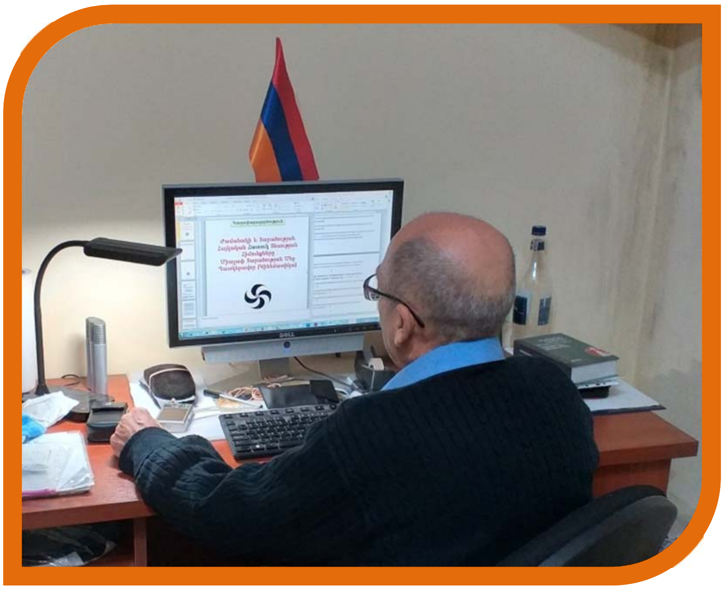
From Previous Page We Obtain the Set of Independent Equations

➢ *From the relations given in (14_21-23) only the following three equations are independent*

$$\begin{cases} (\Gamma_{\lambda\mu})^2 \dfrac{dV_{\lambda\mu}}{d\tau} + (\Gamma_{\mu\lambda})^2 \dfrac{dV_{\mu\lambda}}{d\tau} = 0 \\ (\Gamma_{\lambda\sigma})^2 \dfrac{dU_{\lambda\sigma}}{d\tau} - (\Gamma_{\mu\sigma})^2 \dfrac{dU_{\mu\sigma}}{d\tau} = (\Gamma_{\lambda\mu})^2 \dfrac{dV_{\lambda\mu}}{d\tau} \\ (\Gamma_{\sigma\lambda})^2 \dfrac{dU_{\sigma\lambda}}{d\tau} - (\Gamma_{\sigma\mu})^2 \dfrac{dU_{\sigma\mu}}{d\tau} = (\Gamma_{\mu\lambda})^2 \dfrac{dV_{\mu\lambda}}{d\tau} \end{cases}$$ 14_24

➢ *In the above three equations by replacing the derivatives of velocities with corresponding accelerations given in (13_13,14), we obtain transformation relations of the accelerations*

$$\begin{cases} (\Gamma_{\lambda\mu})^3 A_{\lambda\mu} + (\Gamma_{\mu\lambda})^3 A_{\mu\lambda} = 0 \\ (\Gamma_{\lambda\sigma})^3 B_{\lambda\sigma} - (\Gamma_{\mu\sigma})^3 B_{\mu\sigma} = (\Gamma_{\lambda\mu})^3 A_{\lambda\mu} \\ (\Gamma_{\sigma\lambda})^3 B_{\sigma\lambda} - (\Gamma_{\sigma\mu})^3 B_{\sigma\mu} = (\Gamma_{\mu\lambda})^3 A_{\mu\lambda} \end{cases}$$ 14_25



14_26

Translating third volume of our research work from Armenian to English, using two online translators and then editing it. Sorry for our none-professional translation.
(November 28, 2019, Yerevan, Armenia)

Definition of Armenian Accelerations and Their Transformations

- *Let's define Armenian accelerations with additional Armenian capital letter "Հ", as follows*

14_27

$$\begin{cases} A_{\text{Հ}\lambda\mu} = (\Gamma_{\lambda\mu})^3 A_{\lambda\mu} \\ A_{\text{Հ}\mu\lambda} = (\Gamma_{\mu\lambda})^3 A_{\mu\lambda} \end{cases} \quad \text{and} \quad \begin{cases} B_{\text{Հ}\lambda\sigma} = (\Gamma_{\lambda\sigma})^3 B_{\lambda\sigma} \\ B_{\text{Հ}\mu\sigma} = (\Gamma_{\mu\sigma})^3 B_{\mu\sigma} \end{cases} \quad \text{and} \quad \begin{cases} B_{\text{Հ}\sigma\lambda} = (\Gamma_{\sigma\lambda})^3 B_{\sigma\lambda} \\ B_{\text{Հ}\sigma\mu} = (\Gamma_{\sigma\mu})^3 B_{\sigma\mu} \end{cases}$$

- *New defined Armenian accelerations inserting into accelerations transformations relations given in (14_25), we obtain particle's Armenian accelerations transformation equations*

14_28

In the case of direct movement of a particle

$$\begin{cases} B_{\text{Հ}\mu\sigma} = B_{\text{Հ}\lambda\sigma} - A_{\text{Հ}\lambda\mu} \\ B_{\text{Հ}\lambda\sigma} = B_{\text{Հ}\mu\sigma} - A_{\text{Հ}\mu\lambda} \end{cases}$$

and

In the case of reflected movement of a particle

$$\begin{cases} B_{\text{Հ}\sigma\mu} = B_{\text{Հ}\sigma\lambda} - A_{\text{Հ}\mu\lambda} \\ B_{\text{Հ}\sigma\lambda} = B_{\text{Հ}\sigma\mu} - A_{\text{Հ}\lambda\mu} \end{cases}$$

- *Using the particle acceleration relations given in (11_23) and the Armenian gamma coefficients relations given in (12_17,18), we will find that the Armenian reciprocal accelerations of a particle is opposite to each other*

14_29

$$\begin{cases} B_{\text{Հ}\lambda\sigma} + B_{\text{Հ}\sigma\lambda} = 0 \\ B_{\text{Հ}\mu\sigma} + B_{\text{Հ}\sigma\mu} = 0 \end{cases} \Rightarrow \quad A_{\text{Հ}\lambda\mu} + A_{\text{Հ}\mu\lambda} = 0$$

- *If we return to the case of inertial observing systems, which means that the relative accelerations is equal to zero, then from (14_28) will follow that the direct or reflected Armenian accelerations of the particle with respect to all inertial systems are equal to each other (Armenian interpretation of Newton's second law of mechanics)*

14_30

$$\begin{cases} A_{\text{Հ}\lambda\mu} = 0 \\ A_{\text{Հ}\mu\lambda} = 0 \end{cases} \Rightarrow \begin{cases} B_{\text{Հ}\lambda\sigma} = B_{\text{Հ}\mu\sigma} \\ B_{\text{Հ}\sigma\lambda} = B_{\text{Հ}\sigma\mu} \end{cases}$$

Chapter 15

Definitions and Formulas of Absolute Velocity And Absolute Acceleration Components

Since in chapter 13 we were able to define the concept of absolute time, it is natural that now we define the concept of absolute physical quantities and get their formulas expressed in non-absolute (or henceforth local) physical quantities, and also get the relations between different absolute physical quantities. And in order to distinguish absolute physical quantities from local physical quantities, we denote them with Armenian capital letter "Բ" as lower index, and the scalar and spatial components of the absolute physical quantity are also denoted with upper indexes "0" and "1" respectively.
In addition, in this chapter we will also consider that the observation systems are non-inertial so that we can experience the beauty and charm of the newly introduced concepts and derived formulas.

Notations and Definitions of Absolute Velocity Components

- *Using the relations given in (13_12), we can denote and define the components of absolute relative velocities in the following way*

15_01

Absolute direct relative velocities

$$\begin{cases} V^0_{\beta\lambda\mu} = \dfrac{d(cT_{\lambda\mu})}{d\tau} = c\Gamma_{\lambda\mu} > 0 \\ V^1_{\beta\lambda\mu} = \dfrac{dX_{\lambda\mu}}{d\tau} = V_{\lambda\mu}\Gamma_{\lambda\mu} \end{cases}$$

and

Absolute inverse relative velocities

$$\begin{cases} V^0_{\beta\mu\lambda} = \dfrac{d(cT_{\mu\lambda})}{d\tau} = c\Gamma_{\mu\lambda} > 0 \\ V^1_{\beta\mu\lambda} = \dfrac{dX_{\mu\lambda}}{d\tau} = V_{\mu\lambda}\Gamma_{\mu\lambda} \end{cases}$$

- *If the observation systems are inertial, which means that the relative velocities become constant quantities, then the components of the absolute relative velocities are also constant quantities*

15_02

$$\begin{cases} V^0_{\beta\lambda\mu} = \text{constant} \\ V^1_{\beta\lambda\mu} = \text{constant} \end{cases} \quad \text{and} \quad \begin{cases} V^0_{\beta\mu\lambda} = \text{constant} \\ V^1_{\beta\mu\lambda} = \text{constant} \end{cases}$$

- *Using the relations given in (13_12), we can denote and define the scalar and spatial components of the direct and reflected absolute velocities of the particle with respect to the observing system* λ

15_03

Absolute direct velocities of a particle

$$\begin{cases} U^0_{\beta\lambda\sigma} = \dfrac{d(cT_{\lambda\sigma})}{d\tau} = c\Gamma_{\lambda\sigma} > 0 \\ U^1_{\beta\lambda\sigma} = \dfrac{dX_{\lambda\sigma}}{d\tau} = U_{\lambda\sigma}\Gamma_{\lambda\sigma} \end{cases}$$

and

Absolute reflected velocities of a particle

$$\begin{cases} U^0_{\beta\sigma\lambda} = \dfrac{d(cT_{\sigma\lambda})}{d\tau} = c\Gamma_{\sigma\lambda} > 0 \\ U^1_{\beta\sigma\lambda} = \dfrac{dX_{\sigma\lambda}}{d\tau} = U_{\sigma\lambda}\Gamma_{\sigma\lambda} \end{cases}$$

- *Using the relations given in (13_12), we can denote and define the scalar and spatial components of the direct and reflected absolute velocities of the particle with respect to the observing system* μ

15_04

Absolute direct velocities of a particle

$$\begin{cases} U^0_{\beta\mu\sigma} = \dfrac{d(cT_{\mu\sigma})}{d\tau} = c\Gamma_{\mu\sigma} > 0 \\ U^1_{\beta\mu\sigma} = \dfrac{dX_{\mu\sigma}}{d\tau} = U_{\mu\sigma}\Gamma_{\mu\sigma} \end{cases}$$

and

Absolute reflected velocities of a particle

$$\begin{cases} U^0_{\beta\sigma\mu} = \dfrac{d(cT_{\sigma\mu})}{d\tau} = c\Gamma_{\sigma\mu} > 0 \\ U^1_{\beta\sigma\mu} = \dfrac{dX_{\sigma\mu}}{d\tau} = U_{\sigma\mu}\Gamma_{\sigma\mu} \end{cases}$$

In the Case of Non-Inertial Observing Systems and in the Observation of the Direct Motion of a Particle, Notations and Definitions of Absolute Acceleration Components

➤ *The notations and definitions of absolute direct relative acceleration components, expressed by the corresponding Armenian acceleration*

$$
\begin{cases}
A^{0}_{\text{բ}\lambda\mu} = \dfrac{dV^{0}_{\text{բ}\lambda\mu}}{d\tau} = -\,(\Gamma_{\lambda\mu})^{4}\left(\tfrac{1}{2}s + g\dfrac{V_{\lambda\mu}}{c}\right)A_{\lambda\mu} = -\,\Gamma_{\lambda\mu}\left(\tfrac{1}{2}s + g\dfrac{V_{\lambda\mu}}{c}\right)A_{\text{զ}\lambda\mu} \\
A^{1}_{\text{բ}\lambda\mu} = \dfrac{dV^{1}_{\text{բ}\lambda\mu}}{d\tau} = +\,(\Gamma_{\lambda\mu})^{4}\left(1 + \tfrac{1}{2}s\dfrac{V_{\lambda\mu}}{c}\right)A_{\lambda\mu} = +\,\Gamma_{\lambda\mu}\left(1 + \tfrac{1}{2}s\dfrac{V_{\lambda\mu}}{c}\right)A_{\text{զ}\lambda\mu}
\end{cases}
$$

15_05

➤ *If the observation systems are inertial, which means the local direct relative acceleration is equal to zero, then the components of the absolute direct relative acceleration will also be equal to zero*

$$
A_{\text{զ}\lambda\mu} = (\Gamma_{\lambda\mu})^{3}A_{\lambda\mu} = 0 \quad \Rightarrow \quad
\begin{cases}
A^{0}_{\text{բ}\lambda\mu} = 0 \\
A^{1}_{\text{բ}\lambda\mu} = 0
\end{cases}
$$

15_06

➤ *Notations and definitions of the scalar and spatial components of absolute acceleration in the case when observing the direct movement of a particle with respect to the λ system, expressed by the corresponding Armenian acceleration*

$$
\begin{cases}
B^{0}_{\text{բ}\lambda\sigma} = \dfrac{dU^{0}_{\text{բ}\lambda\sigma}}{d\tau} = -\,(\Gamma_{\lambda\sigma})^{4}\left(\tfrac{1}{2}s + g\dfrac{U_{\lambda\sigma}}{c}\right)B_{\lambda\sigma} = -\,\Gamma_{\lambda\sigma}\left(\tfrac{1}{2}s + g\dfrac{U_{\lambda\sigma}}{c}\right)B_{\text{զ}\lambda\sigma} \\
B^{1}_{\text{բ}\lambda\sigma} = \dfrac{dU^{1}_{\text{բ}\lambda\sigma}}{d\tau} = +\,(\Gamma_{\lambda\sigma})^{4}\left(1 + \tfrac{1}{2}s\dfrac{U_{\lambda\sigma}}{c}\right)B_{\lambda\sigma} = +\,\Gamma_{\lambda\sigma}\left(1 + \tfrac{1}{2}s\dfrac{U_{\lambda\sigma}}{c}\right)B_{\text{զ}\lambda\sigma}
\end{cases}
$$

15_07

➤ *Notations and definitions of the scalar and spatial components of absolute acceleration in the case when observing the direct movement of a particle with respect to the μ system, expressed by the corresponding Armenian acceleration*

$$
\begin{cases}
B^{0}_{\text{բ}\mu\sigma} = \dfrac{dU^{0}_{\text{բ}\mu\sigma}}{d\tau} = -\,(\Gamma_{\mu\sigma})^{4}\left(\tfrac{1}{2}s + g\dfrac{U_{\mu\sigma}}{c}\right)B_{\mu\sigma} = -\,\Gamma_{\mu\sigma}\left(\tfrac{1}{2}s + g\dfrac{U_{\mu\sigma}}{c}\right)B_{\text{զ}\mu\sigma} \\
B^{1}_{\text{բ}\mu\sigma} = \dfrac{dU^{1}_{\text{բ}\mu\sigma}}{d\tau} = +\,(\Gamma_{\mu\sigma})^{4}\left(1 + \tfrac{1}{2}s\dfrac{U_{\mu\sigma}}{c}\right)B_{\mu\sigma} = +\,\Gamma_{\mu\sigma}\left(1 + \tfrac{1}{2}s\dfrac{U_{\mu\sigma}}{c}\right)B_{\text{զ}\mu\sigma}
\end{cases}
$$

15_08

In the Case of Non-Inertial Observing Systems and in the Observation of the Reflected Motion of a Particle, Notations and Definitions of Absolute Acceleration Components

- *The notations and definitions of absolute inverse relative acceleration components, expressed by the corresponding Armenian acceleration*

15_09

$$\begin{cases} A^0_{\rho\mu\lambda} = \dfrac{dV^0_{\rho\mu\lambda}}{d\tau} = -\,(\Gamma_{\mu\lambda})^4\left(\tfrac{1}{2}s + g\dfrac{V_{\mu\lambda}}{c}\right)A_{\mu\lambda} = -\,\Gamma_{\mu\lambda}\left(\tfrac{1}{2}s + g\dfrac{V_{\mu\lambda}}{c}\right)A_{\zeta\mu\lambda} \\ A^1_{\rho\mu\lambda} = \dfrac{dV^1_{\rho\mu\lambda}}{d\tau} = +\,(\Gamma_{\mu\lambda})^4\left(1 + \tfrac{1}{2}s\dfrac{V_{\mu\lambda}}{c}\right)A_{\mu\lambda} = +\,\Gamma_{\mu\lambda}\left(1 + \tfrac{1}{2}s\dfrac{V_{\mu\lambda}}{c}\right)A_{\zeta\mu\lambda} \end{cases}$$

- *If the observation systems are inertial, which means the local inverse relative acceleration is equal to zero, then the components of the absolute inverse relative acceleration will also be equal to zero*

15_10

$$A_{\zeta\mu\lambda} = (\Gamma_{\mu\lambda})^3 A_{\mu\lambda} = 0 \quad \Rightarrow \quad \begin{cases} A^0_{\rho\mu\lambda} = 0 \\ A^1_{\rho\mu\lambda} = 0 \end{cases}$$

- *Notations and definitions of the scalar and spatial components of absolute acceleration in the case when observing the reflected movement of a particle with respect to the λ system, expressed by the corresponding Armenian acceleration*

15_11

$$\begin{cases} B^0_{\rho\sigma\lambda} = \dfrac{dU^0_{\rho\sigma\lambda}}{d\tau} = -\,(\Gamma_{\sigma\lambda})^4\left(\tfrac{1}{2}s + g\dfrac{U_{\sigma\lambda}}{c}\right)B_{\sigma\lambda} = -\,\Gamma_{\sigma\lambda}\left(\tfrac{1}{2}s + g\dfrac{U_{\sigma\lambda}}{c}\right)B_{\zeta\sigma\lambda} \\ B^1_{\rho\sigma\lambda} = \dfrac{dU^1_{\rho\sigma\lambda}}{d\tau} = +\,(\Gamma_{\sigma\lambda})^4\left(1 + \tfrac{1}{2}s\dfrac{U_{\sigma\lambda}}{c}\right)B_{\sigma\lambda} = +\,\Gamma_{\sigma\lambda}\left(1 + \tfrac{1}{2}s\dfrac{U_{\sigma\lambda}}{c}\right)B_{\zeta\sigma\lambda} \end{cases}$$

- *Notations and definitions of the scalar and spatial components of absolute acceleration in the case when observing the reflected movement of a particle with respect to the μ system, expressed by the corresponding Armenian acceleration*

15_12

$$\begin{cases} B^0_{\rho\sigma\mu} = \dfrac{dU^0_{\rho\sigma\mu}}{d\tau} = -\,(\Gamma_{\sigma\mu})^4\left(\tfrac{1}{2}s + g\dfrac{U_{\sigma\mu}}{c}\right)B_{\sigma\mu} = -\,\Gamma_{\sigma\mu}\left(\tfrac{1}{2}s + g\dfrac{U_{\sigma\mu}}{c}\right)B_{\zeta\sigma\mu} \\ B^1_{\rho\sigma\mu} = \dfrac{dU^1_{\rho\sigma\mu}}{d\tau} = +\,(\Gamma_{\sigma\mu})^4\left(1 + \tfrac{1}{2}s\dfrac{U_{\sigma\mu}}{c}\right)B_{\sigma\mu} = +\,\Gamma_{\sigma\mu}\left(1 + \tfrac{1}{2}s\dfrac{U_{\sigma\mu}}{c}\right)B_{\zeta\sigma\mu} \end{cases}$$

Armenian Transformations of Direct and Inverse Absolute Velocity Scalar and Spatial Components

- *Armenian transformations of direct and inverse absolute relative velocity components*

Direct transformation relations and Inverse transformation relations

$$\begin{cases} V^0_{\beta\mu\lambda} = V^0_{\beta\lambda\mu} + SV^1_{\beta\lambda\mu} \\ V^1_{\beta\mu\lambda} = -V^1_{\beta\lambda\mu} \end{cases} \quad \text{and} \quad \begin{cases} V^0_{\beta\lambda\mu} = V^0_{\beta\mu\lambda} + SV^1_{\beta\mu\lambda} \\ V^1_{\beta\lambda\mu} = -V^1_{\beta\mu\lambda} \end{cases} \qquad 15\_13$$

- *In the case of observation of the direct and reflected motion of the particle with respect to the* λ *system, the Armenian transformations of the components of the absolute velocities of the particle*

Direct transformation relations and Inverse transformation relations

$$\begin{cases} U^0_{\beta\sigma\lambda} = U^0_{\beta\lambda\sigma} + SU^1_{\beta\lambda\sigma} \\ U^1_{\beta\sigma\lambda} = -U^1_{\beta\lambda\sigma} \end{cases} \quad \text{and} \quad \begin{cases} U^0_{\beta\lambda\sigma} = U^0_{\beta\sigma\lambda} + SU^1_{\beta\sigma\lambda} \\ U^1_{\beta\lambda\sigma} = -U^1_{\beta\sigma\lambda} \end{cases} \qquad 15\_14$$

- *In the case of observation of the direct and reflected motion of the particle with respect to the* μ *system, the Armenian transformations of the components of the absolute velocities of the particle*

Direct transformation relations and Inverse transformation relations

$$\begin{cases} U^0_{\beta\sigma\mu} = U^0_{\beta\mu\sigma} + SU^1_{\beta\mu\sigma} \\ U^1_{\beta\sigma\mu} = -U^1_{\beta\mu\sigma} \end{cases} \quad \text{and} \quad \begin{cases} U^0_{\beta\mu\sigma} = U^0_{\beta\sigma\mu} + SU^1_{\beta\sigma\mu} \\ U^1_{\beta\mu\sigma} = -U^1_{\beta\sigma\mu} \end{cases} \qquad 15\_15$$

- *The above mentioned Armenian transformations show that the direct and inverse spatial components of absolute velocities are opposite to each other*

$$\begin{cases} V^1_{\beta\lambda\mu} + V^1_{\beta\mu\lambda} = 0 \\ U^1_{\beta\lambda\sigma} + U^1_{\beta\sigma\lambda} = 0 \\ U^1_{\beta\mu\sigma} + U^1_{\beta\sigma\mu} = 0 \end{cases} \qquad 15\_16$$

Armenian Transformations of Direct and Inverse Absolute Acceleration Scalar and Spatial Components

- *Armenian transformations of direct and inverse absolute relative acceleration components*

15_17

Direct transformation relations and Inverse transformation relations

$$\begin{cases} A^0_{\rho\mu\lambda} = A^0_{\rho\lambda\mu} + SA^1_{\rho\lambda\mu} \\ A^1_{\rho\mu\lambda} = -A^1_{\rho\lambda\mu} \end{cases} \quad \text{and} \quad \begin{cases} A^0_{\rho\lambda\mu} = A^0_{\rho\mu\lambda} + SA^1_{\rho\mu\lambda} \\ A^1_{\rho\lambda\mu} = -A^1_{\rho\mu\lambda} \end{cases}$$

- *When observing the direct and reflected motion of the particle with respect to the λ system, the Armenian transformations of the components of the absolute accelerations of the particle*

15_18

Direct transformation relations and Inverse transformation relations

$$\begin{cases} B^0_{\rho\sigma\lambda} = B^0_{\rho\lambda\sigma} + SB^1_{\rho\lambda\sigma} \\ B^1_{\rho\sigma\lambda} = -B^1_{\rho\lambda\sigma} \end{cases} \quad \text{and} \quad \begin{cases} B^0_{\rho\lambda\sigma} = B^0_{\rho\sigma\lambda} + SB^1_{\rho\sigma\lambda} \\ B^1_{\rho\lambda\sigma} = -B^1_{\rho\sigma\lambda} \end{cases}$$

- *When observing of the direct and reflected motion of the particle with respect to the μ system, the Armenian transformations of the components of the absolute accelerations of the particle*

15_19

Direct transformation relations and Inverse transformation relations

$$\begin{cases} B^0_{\rho\sigma\mu} = B^0_{\rho\mu\sigma} + SB^1_{\rho\mu\sigma} \\ B^1_{\rho\sigma\mu} = -B^1_{\rho\mu\sigma} \end{cases} \quad \text{and} \quad \begin{cases} B^0_{\rho\mu\sigma} = B^0_{\rho\sigma\mu} + SB^1_{\rho\sigma\mu} \\ B^1_{\rho\mu\sigma} = -B^1_{\rho\sigma\mu} \end{cases}$$

- *The above mentioned Armenian transformations show that the direct and inverse spatial components of absolute accelerations are also opposite to each other*

15_20

$$\begin{cases} A^1_{\rho\lambda\mu} + A^1_{\rho\mu\lambda} = 0 \\ B^1_{\rho\lambda\sigma} + B^1_{\rho\sigma\lambda} = 0 \\ B^1_{\rho\mu\sigma} + B^1_{\rho\sigma\mu} = 0 \end{cases}$$

Armenian Quadratic Relations Constructed of Absolute Velocity Components are a Universal Constant Quantity

- *Using the absolute relative velocity components formulas given in (15_01), we will find that the Armenian quadratic expressions constructed of these components are equal to the square of the universal constant* c

$$\begin{cases} (V^0_{\text{ß}\lambda\mu})^2 + s(V^0_{\text{ß}\lambda\mu})(V^1_{\text{ß}\lambda\mu}) + g(V^1_{\text{ß}\lambda\mu})^2 = c^2 \\ (V^0_{\text{ß}\mu\lambda})^2 + s(V^0_{\text{ß}\mu\lambda})(V^1_{\text{ß}\mu\lambda}) + g(V^1_{\text{ß}\mu\lambda})^2 = c^2 \end{cases} \tag{15\_21}$$

- *Using the formulas of direct and reflected absolute velocity components of a particle with respect to the observing system* λ *and given in (15_03), we will find that the Armenian quadratic expressions constructed of these components are equal to the square of the universal constant* c

$$\begin{cases} (U^0_{\text{ß}\lambda\sigma})^2 + s(U^0_{\text{ß}\lambda\sigma})(U^1_{\text{ß}\lambda\sigma}) + g(U^1_{\text{ß}\lambda\sigma})^2 = c^2 \\ (U^0_{\text{ß}\sigma\lambda})^2 + s(U^0_{\text{ß}\sigma\lambda})(U^1_{\text{ß}\sigma\lambda}) + g(U^1_{\text{ß}\sigma\lambda})^2 = c^2 \end{cases} \tag{15\_22}$$

- *Using the formulas of direct and reflected absolute velocity components of a particle with respect to the observing system* μ *and given in (15_04), we will find that the Armenian quadratic expressions constructed of these components are equal to the square of the universal constant* c

$$\begin{cases} (U^0_{\text{ß}\mu\sigma})^2 + s(U^0_{\text{ß}\mu\sigma})(U^1_{\text{ß}\mu\sigma}) + g(U^1_{\text{ß}\mu\sigma})^2 = c^2 \\ (U^0_{\text{ß}\sigma\mu})^2 + s(U^0_{\text{ß}\sigma\mu})(U^1_{\text{ß}\sigma\mu}) + g(U^1_{\text{ß}\sigma\mu})^2 = c^2 \end{cases} \tag{15\_23}$$

Armenian Quadratic Relations Constructed of Absolute Acceleration Components are Expressed by the Corresponding Armenian Accelerations

- *Using the absolute relative acceleration components formulas given in(15_05,09), as well as expressions given in (12_08), we will obtain the Armenian quadratic expressions for absolute acceleration components, expressed by the corresponding Armenian accelerations*

15_24

$$\left\{\begin{array}{lcl} (A^{0}_{\text{բ}\lambda\mu})^2 + s(A^{0}_{\text{բ}\lambda\mu})(A^{1}_{\text{բ}\lambda\mu}) + g(A^{1}_{\text{բ}\lambda\mu})^2 & = & \left(g - \frac{1}{4}s^2\right)(A_{\text{չ}\lambda\mu})^2 \\ & & \qquad\quad \| \\ (A^{0}_{\text{բ}\mu\lambda})^2 + s(A^{0}_{\text{բ}\mu\lambda})(A^{1}_{\text{բ}\mu\lambda}) + g(A^{1}_{\text{բ}\mu\lambda})^2 & = & \left(g - \frac{1}{4}s^2\right)(A_{\text{չ}\mu\lambda})^2 \end{array}\right.$$

- *Using the direct and reflected absolute acceleration components formulas of the particle with respect to the observing system λ and given in (15_07,11), as well as the quadratic expressions given in (12_23), we will obtain the Armenian quadratic expressions for the particle's absolute acceleration components, expressed by the corresponding Armenian accelerations*

15_25

$$\left\{\begin{array}{lcl} (B^{0}_{\text{բ}\lambda\sigma})^2 + s(B^{0}_{\text{բ}\lambda\sigma})(B^{1}_{\text{բ}\lambda\sigma}) + g(B^{1}_{\text{բ}\lambda\sigma})^2 & = & \left(g - \frac{1}{4}s^2\right)(B_{\text{չ}\lambda\sigma})^2 \\ & & \qquad\quad \| \\ (B^{0}_{\text{բ}\sigma\lambda})^2 + s(B^{0}_{\text{բ}\sigma\lambda})(B^{1}_{\text{բ}\sigma\lambda}) + g(B^{1}_{\text{բ}\sigma\lambda})^2 & = & \left(g - \frac{1}{4}s^2\right)(B_{\text{չ}\sigma\lambda})^2 \end{array}\right.$$

- *Using the direct and reflected absolute acceleration components formulas of the particle with respect to the observing system μ and given in (15_08,12), as well as the quadratic expressions given in (12_24), we will obtain the Armenian quadratic expressions for the particle's absolute acceleration components, expressed by the corresponding Armenian accelerations*

15_26

$$\left\{\begin{array}{lcl} (B^{0}_{\text{բ}\mu\sigma})^2 + s(B^{0}_{\text{բ}\mu\sigma})(B^{1}_{\text{բ}\mu\sigma}) + g(B^{1}_{\text{բ}\mu\sigma})^2 & = & \left(g - \frac{1}{4}s^2\right)(B_{\text{չ}\mu\sigma})^2 \\ & & \qquad\quad \| \\ (B^{0}_{\text{բ}\sigma\mu})^2 + s(B^{0}_{\text{բ}\sigma\mu})(B^{1}_{\text{բ}\sigma\mu}) + g(B^{1}_{\text{բ}\sigma\mu})^2 & = & \left(g - \frac{1}{4}s^2\right)(B_{\text{չ}\sigma\mu})^2 \end{array}\right.$$

Quantities Composed by Local Velocities and Expressed with Corresponding Absolute Velocity Components

- *Quantities composed of local relative velocities and expressed with corresponding absolute relative velocity components*

$$\begin{cases} \Gamma_{\lambda\mu} = \dfrac{V^0_{\beta\lambda\mu}}{c} \\ \dfrac{V_{\lambda\mu}}{c}\Gamma_{\lambda\mu} = \dfrac{V^1_{\beta\lambda\mu}}{c} \\ \left(1+s\dfrac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu} = \dfrac{V^0_{\beta\lambda\mu}}{c} + s\dfrac{V^1_{\beta\lambda\mu}}{c} \end{cases} \quad \text{and} \quad \begin{cases} \Gamma_{\mu\lambda} = \dfrac{V^0_{\beta\mu\lambda}}{c} \\ \dfrac{V_{\mu\lambda}}{c}\Gamma_{\mu\lambda} = \dfrac{V^1_{\beta\mu\lambda}}{c} \\ \left(1+s\dfrac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda} = \dfrac{V^0_{\beta\mu\lambda}}{c} + s\dfrac{V^1_{\beta\mu\lambda}}{c} \end{cases} \qquad 15\_27$$

- *Quantities composed of particle local velocities with respect to the system λ and expressed with corresponding absolute velocity components of the particle*

$$\begin{cases} \Gamma_{\lambda\sigma} = \dfrac{U^0_{\beta\lambda\sigma}}{c} \\ \dfrac{U_{\lambda\sigma}}{c}\Gamma_{\lambda\sigma} = \dfrac{U^1_{\beta\lambda\sigma}}{c} \\ \left(1+s\dfrac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} = \dfrac{U^0_{\beta\lambda\sigma}}{c} + s\dfrac{U^1_{\beta\lambda\sigma}}{c} \end{cases} \quad \text{and} \quad \begin{cases} \Gamma_{\sigma\lambda} = \dfrac{U^0_{\beta\sigma\lambda}}{c} \\ \dfrac{U_{\sigma\lambda}}{c}\Gamma_{\sigma\lambda} = \dfrac{U^1_{\beta\sigma\lambda}}{c} \\ \left(1+s\dfrac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} = \dfrac{U^0_{\beta\sigma\lambda}}{c} + s\dfrac{U^1_{\beta\sigma\lambda}}{c} \end{cases} \qquad 15\_28$$

- *Quantities composed of particle local velocities with respect to the system μ and expressed with corresponding absolute velocity components of the particle*

$$\begin{cases} \Gamma_{\mu\sigma} = \dfrac{U^0_{\beta\mu\sigma}}{c} \\ \dfrac{U_{\mu\sigma}}{c}\Gamma_{\mu\sigma} = \dfrac{U^1_{\beta\mu\sigma}}{c} \\ \left(1+s\dfrac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} = \dfrac{U^0_{\beta\mu\sigma}}{c} + s\dfrac{U^1_{\beta\mu\sigma}}{c} \end{cases} \quad \text{and} \quad \begin{cases} \Gamma_{\sigma\mu} = \dfrac{U^0_{\beta\sigma\mu}}{c} \\ \dfrac{U_{\sigma\mu}}{c}\Gamma_{\sigma\mu} = \dfrac{U^1_{\beta\sigma\mu}}{c} \\ \left(1+s\dfrac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} = \dfrac{U^0_{\beta\sigma\mu}}{c} + s\dfrac{U^1_{\beta\sigma\mu}}{c} \end{cases} \qquad 15\_29$$

In the Case of the Second Type of Transformation, the Universal Equations of the Armenian Transformation are Expressed with Absolute Relative Velocity Components

- *When observing the particle's direct motion, then the universal equations of the Armenian direct transformation given in (12_29), can be expressed by the corresponding components of the absolute relative velocity*

15_30

$$\begin{cases} cdT_{\mu\sigma} = \left(\dfrac{V^0_{\beta\lambda\mu}}{c} + s\dfrac{V^1_{\beta\lambda\mu}}{c}\right)(cdT_{\lambda\sigma}) + \left(g\dfrac{V^1_{\beta\lambda\mu}}{c}\right)dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \dfrac{V^0_{\beta\lambda\mu}}{c}dX_{\lambda\sigma} - \dfrac{V^1_{\beta\lambda\mu}}{c}(cdT_{\lambda\sigma}) \end{cases}$$

- *When observing the particle's direct motion, then the universal equations of the Armenian inverse transformation given in (12_30), can be expressed by the corresponding components of the absolute relative velocity*

15_31

$$\begin{cases} cdT_{\lambda\sigma} = \left(\dfrac{V^0_{\beta\mu\lambda}}{c} + s\dfrac{V^1_{\beta\mu\lambda}}{c}\right)(cdT_{\mu\sigma}) + \left(g\dfrac{V^1_{\beta\mu\lambda}}{c}\right)dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \dfrac{V^0_{\beta\mu\lambda}}{c}dX_{\mu\sigma} - \dfrac{V^1_{\beta\mu\lambda}}{c}(cdT_{\mu\sigma}) \end{cases}$$

- *When observing the particle's reflected motion, then the universal equations of the Armenian direct transformation given in (12_31), can be expressed by the corresponding components of the absolute relative velocity*

15_32

$$\begin{cases} cdT_{\sigma\mu} = \left(\dfrac{V^0_{\beta\mu\lambda}}{c} + s\dfrac{V^1_{\beta\mu\lambda}}{c}\right)(cdT_{\sigma\lambda}) + \left(g\dfrac{V^1_{\beta\mu\lambda}}{c}\right)dX_{\sigma\lambda} \\ dX_{\sigma\mu} = \dfrac{V^0_{\beta\mu\lambda}}{c}dX_{\sigma\lambda} - \dfrac{V^1_{\beta\mu\lambda}}{c}(cdT_{\sigma\lambda}) \end{cases}$$

- *When observing the particle's reflected motion, then the universal equations of the Armenian inverse transformation given in (12_32), can be expressed by the corresponding components of the absolute relative velocity*

15_33

$$\begin{cases} cdT_{\sigma\lambda} = \left(\dfrac{V^0_{\beta\lambda\mu}}{c} + s\dfrac{V^1_{\beta\lambda\mu}}{c}\right)(cdT_{\sigma\mu}) + \left(g\dfrac{V^1_{\beta\lambda\mu}}{c}\right)dX_{\sigma\mu} \\ dX_{\sigma\lambda} = \dfrac{V^0_{\beta\lambda\mu}}{c}dX_{\sigma\mu} - \dfrac{V^1_{\beta\lambda\mu}}{c}(cdT_{\sigma\mu}) \end{cases}$$

Differentiating by Absolute Time the Particle Universal Transformation Equations of Coordinates We Receive the Particle Universal Transformation Equations of Absolute Velocity Components

- *When observing the particle's direct motion, then differentiating by absolute time the transformation equations given in (15_30), we will obtain the Armenian direct transformation equations of the particle's absolute velocity components*

$$\begin{cases} U^0_{\beta\mu\sigma} = \left(\dfrac{V^0_{\beta\lambda\mu}}{c} + s\dfrac{V^1_{\beta\lambda\mu}}{c}\right)U^0_{\beta\lambda\sigma} + \left(g\dfrac{V^1_{\beta\lambda\mu}}{c}\right)U^1_{\beta\lambda\sigma} \\ U^1_{\beta\mu\sigma} = \dfrac{V^0_{\beta\lambda\mu}}{c}U^1_{\beta\lambda\sigma} - \dfrac{V^1_{\beta\lambda\mu}}{c}U^0_{\beta\lambda\sigma} \end{cases} \quad 15\_34$$

- *When observing the particle's direct motion, then differentiating by absolute time the transformation equations given in (15_31), we will obtain the Armenian inverse transformation equations of the particle's absolute velocity components*

$$\begin{cases} U^0_{\beta\lambda\sigma} = \left(\dfrac{V^0_{\beta\mu\lambda}}{c} + s\dfrac{V^1_{\beta\mu\lambda}}{c}\right)U^0_{\beta\mu\sigma} + \left(g\dfrac{V^1_{\beta\mu\lambda}}{c}\right)U^1_{\beta\mu\sigma} \\ U^1_{\beta\lambda\sigma} = \dfrac{V^0_{\beta\mu\lambda}}{c}U^1_{\beta\mu\sigma} - \dfrac{V^1_{\beta\mu\lambda}}{c}U^0_{\beta\mu\sigma} \end{cases} \quad 15\_35$$

- *When observing the particle's reflected motion, then differentiating by absolute time the transformation equations given in (15_32), we will obtain the Armenian direct transformation equations of the particle's absolute velocity components*

$$\begin{cases} U^0_{\beta\sigma\mu} = \left(\dfrac{V^0_{\beta\mu\lambda}}{c} + s\dfrac{V^1_{\beta\mu\lambda}}{c}\right)U^0_{\beta\sigma\lambda} + \left(g\dfrac{V^1_{\beta\mu\lambda}}{c}\right)U^1_{\beta\sigma\lambda} \\ U^1_{\beta\sigma\mu} = \dfrac{V^0_{\beta\mu\lambda}}{c}U^1_{\beta\sigma\lambda} - \dfrac{V^1_{\beta\mu\lambda}}{c}U^0_{\beta\sigma\lambda} \end{cases} \quad 15\_36$$

- *When observing the particle's reflected motion, then differentiating by absolute time the transformation equations given in (15_33), we will obtain the Armenian inverse transformation equations of the particle's absolute velocity components*

$$\begin{cases} U^0_{\beta\sigma\lambda} = \left(\dfrac{V^0_{\beta\lambda\mu}}{c} + s\dfrac{V^1_{\beta\lambda\mu}}{c}\right)U^0_{\beta\sigma\mu} + \left(g\dfrac{V^1_{\beta\lambda\mu}}{c}\right)U^1_{\beta\sigma\mu} \\ U^1_{\beta\sigma\lambda} = \dfrac{V^0_{\beta\lambda\mu}}{c}U^1_{\beta\sigma\mu} - \dfrac{V^1_{\beta\lambda\mu}}{c}U^0_{\beta\sigma\mu} \end{cases} \quad 15\_37$$

In the Case of Inertial Observing Systems, Differentiating by Absolute Time the Particle's Absolute Velocity Transformation Equations, We Obtain the Universal Transformation Equations of Absolute Acceleration Components

- *When observing the particle's direct motion with respect to the inertial observing systems, then differentiating by absolute time the transformation equations given in (15_34), we will obtain the Armenian direct transformation equations of the particle's absolute acceleration components*

15_38

$$\begin{cases} B^0_{\text{ρμσ}} = \left(\dfrac{V^0_{\text{ρλμ}}}{c} + s\dfrac{V^1_{\text{ρλμ}}}{c}\right)B^0_{\text{ρλσ}} + \left(g\dfrac{V^1_{\text{ρλμ}}}{c}\right)B^1_{\text{ρλσ}} \\ B^1_{\text{ρμσ}} = \dfrac{V^0_{\text{ρλμ}}}{c}B^1_{\text{ρλσ}} - \dfrac{V^1_{\text{ρλμ}}}{c}B^0_{\text{ρλσ}} \end{cases}$$

- *When observing the particle's direct motion with respect to the inertial observing systems, then differentiating by absolute time the transformation equations given in (15_35), we will obtain the Armenian direct transformation equations of the particle's absolute acceleration components*

15_39

$$\begin{cases} B^0_{\text{ρλσ}} = \left(\dfrac{V^0_{\text{ρμλ}}}{c} + s\dfrac{V^1_{\text{ρμλ}}}{c}\right)B^0_{\text{ρμσ}} + \left(g\dfrac{V^1_{\text{ρμλ}}}{c}\right)B^1_{\text{ρμσ}} \\ B^1_{\text{ρλσ}} = \dfrac{V^0_{\text{ρμλ}}}{c}B^1_{\text{ρμσ}} - \dfrac{V^1_{\text{ρμλ}}}{c}B^0_{\text{ρμσ}} \end{cases}$$

- *When observing the particle's reflected motion with respect to the inertial observing systems, then differentiating by absolute time the transformation equations given in (15_36), we will obtain the Armenian direct transformation equations of the particle's absolute acceleration components*

15_40

$$\begin{cases} B^0_{\text{ρσμ}} = \left(\dfrac{V^0_{\text{ρμλ}}}{c} + s\dfrac{V^1_{\text{ρμλ}}}{c}\right)B^0_{\text{ρσλ}} + \left(g\dfrac{V^1_{\text{ρμλ}}}{c}\right)B^1_{\text{ρσλ}} \\ B^1_{\text{ρσμ}} = \dfrac{V^0_{\text{ρμλ}}}{c}B^1_{\text{ρσλ}} - \dfrac{V^1_{\text{ρμλ}}}{c}B^0_{\text{ρσλ}} \end{cases}$$

- *When observing the particle's reflected motion with respect to the inertial observing systems, then differentiating by absolute time the transformation equations given in (15_37), we will obtain the Armenian inverse transformation equations of the particle's absolute acceleration components*

15_41

$$\begin{cases} B^0_{\text{ρσλ}} = \left(\dfrac{V^0_{\text{ρλμ}}}{c} + s\dfrac{V^1_{\text{ρλμ}}}{c}\right)B^0_{\text{ρσμ}} + \left(g\dfrac{V^1_{\text{ρλμ}}}{c}\right)B^1_{\text{ρσμ}} \\ B^1_{\text{ρσλ}} = \dfrac{V^0_{\text{ρλμ}}}{c}B^1_{\text{ρσμ}} - \dfrac{V^1_{\text{ρλμ}}}{c}B^0_{\text{ρσμ}} \end{cases}$$

Chapter 16

The Transformation Equations of the Absolute Quantities Components Expressed Only by the Spatial Components of the Absolute Relative Velocities

This chapter is the immediate vital continuation of the previous chapter, and in this chapter we will get the transformation equations of time-space, components of absolute velocity and absolute acceleration, expressed only by the spatial components of absolute relative velocities.

Scalar Components of Absolute Velocities are Expressed in Spatial Components of Absolute Velocities

- *Using the invariant Armenian quadratic expressions for absolute velocity components given in (15_21-23) and solving them as quadratic equations for the scalar components of the absolute velocities, for them we obtain the following expressions*

16_01

For direct velocities — For inverse velocities

$$\begin{cases} \dfrac{V^0_{\rho\lambda\mu}}{c} = \Lambda_{\rho\lambda\mu} - \frac{1}{2}s\dfrac{V^1_{\rho\lambda\mu}}{c} > 0 \\ \dfrac{U^0_{\rho\lambda\sigma}}{c} = \Lambda_{\rho\lambda\sigma} - \frac{1}{2}s\dfrac{U^1_{\rho\lambda\sigma}}{c} > 0 \\ \dfrac{U^0_{\rho\mu\sigma}}{c} = \Lambda_{\rho\mu\sigma} - \frac{1}{2}s\dfrac{U^1_{\rho\mu\sigma}}{c} > 0 \end{cases} \quad \text{and} \quad \begin{cases} \dfrac{V^0_{\rho\mu\lambda}}{c} = \Lambda_{\rho\mu\lambda} - \frac{1}{2}s\dfrac{V^1_{\rho\mu\lambda}}{c} > 0 \\ \dfrac{U^0_{\rho\sigma\lambda}}{c} = \Lambda_{\rho\sigma\lambda} - \frac{1}{2}s\dfrac{U^1_{\rho\sigma\lambda}}{c} > 0 \\ \dfrac{U^0_{\rho\sigma\mu}}{c} = \Lambda_{\rho\sigma\mu} - \frac{1}{2}s\dfrac{U^1_{\rho\sigma\mu}}{c} > 0 \end{cases}$$

- *In Greek uppercase lambda letter, we have assigned the following expressions, which must have positive values*

16_02

For direct velocities — For inverse velocities

$$\begin{cases} \Lambda_{\rho\lambda\mu} = \sqrt{1-\left(g-\frac{1}{4}s^2\right)\left(\dfrac{V^1_{\rho\lambda\mu}}{c}\right)^2} \\ \Lambda_{\rho\lambda\sigma} = \sqrt{1-\left(g-\frac{1}{4}s^2\right)\left(\dfrac{U^1_{\rho\lambda\sigma}}{c}\right)^2} \\ \Lambda_{\rho\mu\sigma} = \sqrt{1-\left(g-\frac{1}{4}s^2\right)\left(\dfrac{U^1_{\rho\mu\sigma}}{c}\right)^2} \end{cases} \quad \text{and} \quad \begin{cases} \Lambda_{\rho\mu\lambda} = \sqrt{1-\left(g-\frac{1}{4}s^2\right)\left(\dfrac{V^1_{\rho\mu\lambda}}{c}\right)^2} \\ \Lambda_{\rho\sigma\lambda} = \sqrt{1-\left(g-\frac{1}{4}s^2\right)\left(\dfrac{U^1_{\rho\sigma\lambda}}{c}\right)^2} \\ \Lambda_{\rho\sigma\mu} = \sqrt{1-\left(g-\frac{1}{4}s^2\right)\left(\dfrac{U^1_{\rho\sigma\mu}}{c}\right)^2} \end{cases}$$

- *According to (15_16) the absolute value of direct and reflected spatial components of velocities are equal to each other, therefore the corresponding capital lambda coefficients are also equal to each other*

16_03

$$\begin{cases} \Lambda_{\rho\lambda\mu} = \Lambda_{\rho\mu\lambda} \\ \Lambda_{\rho\lambda\sigma} = \Lambda_{\rho\sigma\lambda} \\ \Lambda_{\rho\mu\sigma} = \Lambda_{\rho\sigma\mu} \end{cases}$$

Expressing the Transformation Gamma Coefficients With the Corresponding Capital Lambda Coefficients

- *Using new defined the reciprocal observed absolute relative velocity components given in (15_01), we can express the gamma coefficients of transformations with the newly introduced uppercase lambda coefficients as follows*

$$\begin{cases} \Gamma_{\lambda\mu} = \dfrac{V^0_{\beta\lambda\mu}}{c} = \Lambda_{\beta\lambda\mu} - \dfrac{1}{2}s\dfrac{V^1_{\beta\lambda\mu}}{c} > 0 \\ \Gamma_{\mu\lambda} = \dfrac{V^0_{\beta\mu\lambda}}{c} = \Lambda_{\beta\mu\lambda} - \dfrac{1}{2}s\dfrac{V^1_{\beta\mu\lambda}}{c} > 0 \end{cases} \tag{16_04}$$

- *Using the new defined the particle's absolute velocity components with respect to the observing system λ and that is given in (15_03), we can express the particle's gamma coefficients with newly introduced corresponding uppercase lambda coefficients as follows*

$$\begin{cases} \Gamma_{\lambda\sigma} = \dfrac{U^0_{\beta\lambda\sigma}}{c} = \Lambda_{\beta\lambda\sigma} - \dfrac{1}{2}s\dfrac{U^1_{\beta\lambda\sigma}}{c} > 0 \\ \Gamma_{\sigma\lambda} = \dfrac{U^0_{\beta\sigma\lambda}}{c} = \Lambda_{\beta\sigma\lambda} - \dfrac{1}{2}s\dfrac{U^1_{\beta\sigma\lambda}}{c} > 0 \end{cases} \tag{16_05}$$

- *Using the new defined the particle's absolute velocity components with respect to the observing system μ and that is given in (15_04), we can express the particle's gamma coefficients with newly introduced corresponding capital lambda coefficients as follows*

$$\begin{cases} \Gamma_{\mu\sigma} = \dfrac{U^0_{\beta\mu\sigma}}{c} = \Lambda_{\beta\mu\sigma} - \dfrac{1}{2}s\dfrac{U^1_{\beta\mu\sigma}}{c} > 0 \\ \Gamma_{\sigma\mu} = \dfrac{U^0_{\beta\sigma\mu}}{c} = \Lambda_{\beta\sigma\mu} - \dfrac{1}{2}s\dfrac{U^1_{\beta\sigma\mu}}{c} > 0 \end{cases} \tag{16_06}$$

Local Velocities Expressed in Corresponding Spatial Components of the Absolute Velocities

- *Using (15_01) and (16_04), local relative velocities can be expressed by the spatial components of the corresponding absolute relative velocity*

16_07

$$\begin{cases} V_{\lambda\mu} = \dfrac{V^1_{\rho\lambda\mu}}{\Gamma_{\lambda\mu}} = \dfrac{V^1_{\rho\lambda\mu}}{\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\dfrac{V^1_{\rho\lambda\mu}}{c}} \\ V_{\mu\lambda} = \dfrac{V^1_{\rho\mu\lambda}}{\Gamma_{\mu\lambda}} = \dfrac{V^1_{\rho\mu\lambda}}{\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\dfrac{V^1_{\rho\mu\lambda}}{c}} \end{cases}$$

- *Using (15_03) and (16_05), the local velocities of the particle with respect to the observing system λ, can be expressed by the spatial components of the particle corresponding absolute velocity as follows*

16_08

$$\begin{cases} U_{\lambda\sigma} = \dfrac{U^1_{\rho\lambda\sigma}}{\Gamma_{\lambda\sigma}} = \dfrac{U^1_{\rho\lambda\sigma}}{\Lambda_{\rho\lambda\sigma} - \frac{1}{2}s\dfrac{U^1_{\rho\lambda\sigma}}{c}} \\ U_{\sigma\lambda} = \dfrac{U^1_{\rho\sigma\lambda}}{\Gamma_{\sigma\lambda}} = \dfrac{U^1_{\rho\sigma\lambda}}{\Lambda_{\rho\sigma\lambda} - \frac{1}{2}s\dfrac{U^1_{\rho\sigma\lambda}}{c}} \end{cases}$$

- *Using (15_04) and (16_06), the local velocities of the particle with respect to the observing system μ, can be expressed by the spatial components of the particle corresponding absolute velocity as follows*

16_09

$$\begin{cases} U_{\mu\sigma} = \dfrac{U^1_{\rho\mu\sigma}}{\Gamma_{\mu\sigma}} = \dfrac{U^1_{\rho\mu\sigma}}{\Lambda_{\rho\mu\sigma} - \frac{1}{2}s\dfrac{U^1_{\rho\mu\sigma}}{c}} \\ U_{\sigma\mu} = \dfrac{U^1_{\rho\sigma\mu}}{\Gamma_{\sigma\mu}} = \dfrac{U^1_{\rho\sigma\mu}}{\Lambda_{\rho\sigma\mu} - \frac{1}{2}s\dfrac{U^1_{\rho\sigma\mu}}{c}} \end{cases}$$

Various Useful Relations Between Armenian Gamma Coefficients and Capital Lambda Coefficients

- *Using the formulas given in (15_01-04) and (16_01), we will obtain the following relations between the direct uppercase lambda coefficients and the corresponding Armenian gamma coefficients*

$$\begin{cases} \Lambda_{\rho\lambda\mu} = \dfrac{V^0_{\rho\lambda\mu}}{c} + \dfrac{1}{2}s\dfrac{V^1_{\rho\lambda\mu}}{c} = \left(1+\dfrac{1}{2}s\dfrac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu} \\ \Lambda_{\rho\lambda\sigma} = \dfrac{U^0_{\rho\lambda\sigma}}{c} + \dfrac{1}{2}s\dfrac{U^1_{\rho\lambda\sigma}}{c} = \left(1+\dfrac{1}{2}s\dfrac{U_{\lambda\sigma}}{c}\right)\Gamma_{\lambda\sigma} \\ \Lambda_{\rho\mu\sigma} = \dfrac{U^0_{\rho\mu\sigma}}{c} + \dfrac{1}{2}s\dfrac{U^1_{\rho\mu\sigma}}{c} = \left(1+\dfrac{1}{2}s\dfrac{U_{\mu\sigma}}{c}\right)\Gamma_{\mu\sigma} \end{cases} \quad \text{16\_10}$$

- *Using the formulas given in (15_01-04) and (16_01), we will obtain the following relations between the inverse uppercase lambda coefficients and the corresponding Armenian gamma coefficients*

$$\begin{cases} \Lambda_{\rho\mu\lambda} = \dfrac{V^0_{\rho\mu\lambda}}{c} + \dfrac{1}{2}s\dfrac{V^1_{\rho\mu\lambda}}{c} = \left(1+\dfrac{1}{2}s\dfrac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda} \\ \Lambda_{\rho\sigma\lambda} = \dfrac{U^0_{\rho\sigma\lambda}}{c} + \dfrac{1}{2}s\dfrac{U^1_{\rho\sigma\lambda}}{c} = \left(1+\dfrac{1}{2}s\dfrac{U_{\sigma\lambda}}{c}\right)\Gamma_{\sigma\lambda} \\ \Lambda_{\rho\sigma\mu} = \dfrac{U^0_{\rho\sigma\mu}}{c} + \dfrac{1}{2}s\dfrac{U^1_{\rho\sigma\mu}}{c} = \left(1+\dfrac{1}{2}s\dfrac{U_{\sigma\mu}}{c}\right)\Gamma_{\sigma\mu} \end{cases} \quad \text{16\_11}$$

- *Few important relations can be constructed by local relative velocities and corresponding transformation gamma coefficients and those can be expressed by the corresponding spatial components of absolute relative velocities*

$$\begin{cases} \Gamma_{\lambda\mu} = \Lambda_{\rho\lambda\mu} - \dfrac{1}{2}s\dfrac{V^1_{\rho\lambda\mu}}{c} \\ \left(1+s\dfrac{V_{\lambda\mu}}{c}\right)\Gamma_{\lambda\mu} = \Lambda_{\rho\lambda\mu} + \dfrac{1}{2}s\dfrac{V^1_{\rho\lambda\mu}}{c} \\ \dfrac{V_{\lambda\mu}}{c}\Gamma_{\lambda\mu} = \dfrac{V^1_{\rho\lambda\mu}}{c} \end{cases} \quad \text{and} \quad \begin{cases} \Gamma_{\mu\lambda} = \Lambda_{\rho\mu\lambda} - \dfrac{1}{2}s\dfrac{V^1_{\rho\mu\lambda}}{c} \\ \left(1+s\dfrac{V_{\mu\lambda}}{c}\right)\Gamma_{\mu\lambda} = \Lambda_{\rho\mu\lambda} + \dfrac{1}{2}s\dfrac{V^1_{\rho\mu\lambda}}{c} \\ \dfrac{V_{\mu\lambda}}{c}\Gamma_{\mu\lambda} = \dfrac{V^1_{\rho\mu\lambda}}{c} \end{cases} \quad \text{16\_12}$$

In the Case of the Second Type of Transformation, the Universal Equations of the Armenian Transformations Expressed with Spatial Components of Absolute Relative Velocity

- *The Armenian direct transformation equations for the coordinates, when observing the particle's direct motion, expressed by the corresponding spatial components of absolute relative velocity*

16_13

$$\begin{cases} cdT_{\mu\sigma} = \left(\Lambda_{\rho\lambda\mu} + \frac{1}{2}s\frac{V^{1}_{\rho\lambda\mu}}{c}\right)(cdT_{\lambda\sigma}) + \left(g\frac{V^{1}_{\rho\lambda\mu}}{c}\right)dX_{\lambda\sigma} \\ dX_{\mu\sigma} = \left(\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\frac{V^{1}_{\rho\lambda\mu}}{c}\right)dX_{\lambda\sigma} - \frac{V^{1}_{\rho\lambda\mu}}{c}(cdT_{\lambda\sigma}) \end{cases}$$

- *The Armenian inverse transformation equations for the coordinates, when observing the particle's direct motion, expressed by the corresponding spatial components of absolute relative velocity*

16_14

$$\begin{cases} cdT_{\lambda\sigma} = \left(\Lambda_{\rho\mu\lambda} + \frac{1}{2}s\frac{V^{1}_{\rho\mu\lambda}}{c}\right)(cdT_{\mu\sigma}) + \left(g\frac{V^{1}_{\rho\mu\lambda}}{c}\right)dX_{\mu\sigma} \\ dX_{\lambda\sigma} = \left(\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\frac{V^{1}_{\rho\mu\lambda}}{c}\right)dX_{\mu\sigma} - \frac{V^{1}_{\rho\mu\lambda}}{c}(cdT_{\mu\sigma}) \end{cases}$$

- *The Armenian direct transformation equations for the coordinates, when observing the particle's reflected motion, expressed by the corresponding spatial components of absolute relative velocity*

16_15

$$\begin{cases} cdT_{\sigma\mu} = \left(\Lambda_{\rho\mu\lambda} + \frac{1}{2}s\frac{V^{1}_{\rho\mu\lambda}}{c}\right)(cdT_{\sigma\lambda}) + \left(g\frac{V^{1}_{\rho\mu\lambda}}{c}\right)dX_{\sigma\lambda} \\ dX_{\sigma\mu} = \left(\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\frac{V^{1}_{\rho\mu\lambda}}{c}\right)dX_{\sigma\lambda} - \frac{V^{1}_{\rho\mu\lambda}}{c}(cdT_{\sigma\lambda}) \end{cases}$$

- *The Armenian inverse transformation equations for the coordinates, when observing the particle's reflected motion, expressed by the corresponding spatial components of absolute relative velocity*

16_16

$$\begin{cases} cdT_{\sigma\lambda} = \left(\Lambda_{\rho\lambda\mu} + \frac{1}{2}s\frac{V^{1}_{\rho\lambda\mu}}{c}\right)(cdT_{\sigma\mu}) + \left(g\frac{V^{1}_{\rho\lambda\mu}}{c}\right)dX_{\sigma\mu} \\ dX_{\sigma\lambda} = \left(\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\frac{V^{1}_{\rho\lambda\mu}}{c}\right)dX_{\sigma\mu} - \frac{V^{1}_{\rho\lambda\mu}}{c}(cdT_{\sigma\mu}) \end{cases}$$

By Differentiating the Particle's Coordinates Transformations, With Respect to Absolute Time, We Obtain the Armenian Transformation Equations of the Absolute Velocity Components

- *The Armenian direct transformation equations for the absolute velocity components, when observing the particle's direct motion, expressed by the spatial components of absolute relative velocity*

$$\begin{cases} U^0_{\rho\mu\sigma} = \left(\Lambda_{\rho\lambda\mu} + \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)U^0_{\rho\lambda\sigma} + \left(g\frac{V^1_{\rho\lambda\mu}}{c}\right)U^1_{\rho\lambda\sigma} \\ U^1_{\rho\mu\sigma} = \left(\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)U^1_{\rho\lambda\sigma} - \frac{V^1_{\rho\lambda\mu}}{c}U^0_{\rho\lambda\sigma} \end{cases} \quad \text{16\_17}$$

- *The Armenian inverse transformation equations for the absolute velocity components, when observing the particle's direct motion, expressed by the spatial components of absolute relative velocity*

$$\begin{cases} U^0_{\rho\lambda\sigma} = \left(\Lambda_{\rho\mu\lambda} + \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)U^0_{\rho\mu\sigma} + \left(g\frac{V^1_{\rho\mu\lambda}}{c}\right)U^1_{\rho\mu\sigma} \\ U^1_{\rho\lambda\sigma} = \left(\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)U^1_{\rho\mu\sigma} - \frac{V^1_{\rho\mu\lambda}}{c}U^0_{\rho\mu\sigma} \end{cases} \quad \text{16\_18}$$

- *The Armenian direct transformation equations for the absolute velocity components, when observing the particle's reflected motion, expressed by the spatial components of absolute relative velocity*

$$\begin{cases} U^0_{\rho\sigma\mu} = \left(\Lambda_{\rho\mu\lambda} + \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)U^0_{\rho\sigma\lambda} + \left(g\frac{V^1_{\rho\mu\lambda}}{c}\right)U^1_{\rho\sigma\lambda} \\ U^1_{\rho\sigma\mu} = \left(\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)U^1_{\rho\sigma\lambda} - \frac{V^1_{\rho\mu\lambda}}{c}U^0_{\rho\sigma\lambda} \end{cases} \quad \text{16\_19}$$

- *The Armenian inverse transformation equations for the absolute velocity components, when observing the particle's reflected motion, expressed by the spatial components of absolute relative velocity*

$$\begin{cases} U^0_{\rho\sigma\lambda} = \left(\Lambda_{\rho\lambda\mu} + \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)U^0_{\rho\sigma\mu} + \left(g\frac{V^1_{\rho\lambda\mu}}{c}\right)U^1_{\rho\sigma\mu} \\ U^1_{\rho\sigma\lambda} = \left(\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)U^1_{\rho\sigma\mu} - \frac{V^1_{\rho\lambda\mu}}{c}U^0_{\rho\sigma\mu} \end{cases} \quad \text{16\_20}$$

In the Case of Inertial Observational Systems We Obtain the Universal Transformation Equations of the Particle's Absolute Acceleration Components

- *Armenian direct transformation equations for the absolute acceleration components, when observing the particle's direct motion, expressed by the spatial components of absolute relative velocity*

16_21

$$\begin{cases} B^0_{\rho\mu\sigma} = \left(\Lambda_{\rho\lambda\mu} + \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)B^0_{\rho\lambda\sigma} + \left(g\frac{V^1_{\rho\lambda\mu}}{c}\right)B^1_{\rho\lambda\sigma} \\ B^1_{\rho\mu\sigma} = \left(\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)B^1_{\rho\lambda\sigma} - \frac{V^1_{\rho\lambda\mu}}{c}B^0_{\rho\lambda\sigma} \end{cases}$$

- *Armenian inverse transformation equations for the absolute acceleration components, when observing the particle's direct motion, expressed by the spatial components of absolute relative velocity*

16_22

$$\begin{cases} B^0_{\rho\lambda\sigma} = \left(\Lambda_{\rho\mu\lambda} + \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)B^0_{\rho\mu\sigma} + \left(g\frac{V^1_{\rho\mu\lambda}}{c}\right)B^1_{\rho\mu\sigma} \\ B^1_{\rho\lambda\sigma} = \left(\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)B^1_{\rho\mu\sigma} - \frac{V^1_{\rho\mu\lambda}}{c}B^0_{\rho\mu\sigma} \end{cases}$$

- *Armenian direct transformation equations for the absolute acceleration components, when observing the particle's reflected motion, expressed by the spatial components of absolute relative velocity*

16_23

$$\begin{cases} B^0_{\rho\sigma\mu} = \left(\Lambda_{\rho\mu\lambda} + \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)B^0_{\rho\sigma\lambda} + \left(g\frac{V^1_{\rho\mu\lambda}}{c}\right)B^1_{\rho\sigma\lambda} \\ B^1_{\rho\sigma\mu} = \left(\Lambda_{\rho\mu\lambda} - \frac{1}{2}s\frac{V^1_{\rho\mu\lambda}}{c}\right)B^1_{\rho\sigma\lambda} - \frac{V^1_{\rho\mu\lambda}}{c}B^0_{\rho\sigma\lambda} \end{cases}$$

- *Armenian inverse transformation equations for the absolute acceleration components, when observing the particle's reflected motion, expressed by the spatial components of absolute relative velocity*

16_24

$$\begin{cases} B^0_{\rho\sigma\lambda} = \left(\Lambda_{\rho\lambda\mu} + \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)B^0_{\rho\sigma\mu} + \left(g\frac{V^1_{\rho\lambda\mu}}{c}\right)B^1_{\rho\sigma\mu} \\ B^1_{\rho\sigma\lambda} = \left(\Lambda_{\rho\lambda\mu} - \frac{1}{2}s\frac{V^1_{\rho\lambda\mu}}{c}\right)B^1_{\rho\sigma\mu} - \frac{V^1_{\rho\lambda\mu}}{c}B^0_{\rho\sigma\mu} \end{cases}$$

Chapter 17

(Appendix 1)

The s and g Coefficients are Universal Constant Quantities

In this chapter, we observe the motion of the same σ particle from three different inertial observing λ, μ and ν systems. Thus from these three different inertial systems we can make up three pairs of different observational inertial systems: (λ, μ), (λ, ν) and (μ, ν), from the point of view of which, when considering the coordinates of the particle, there will be three different Armenian direct and inverse transformation equations. In the case of a pair of each observing inertial system, the corresponding coefficients s and g, in the most general case, can be different constants. Naturally, in order to distinguish these transformation invariant coefficients, we will denote them by two lower indexes, which will denote a pair of those observing inertial systems. And in the lower indexes of the observed particle coordinates and the quadratic expressions of the Armenian intervals, we will also denote in brackets the passive participant system of transformation.

The Armenian Transformation Equations of a Moving Particle Coordinates Observed From the Inertial Systems λ and μ

- *Armenian direct transformation equations of the observed σ particle's coordinates*

17_01

$$\begin{cases} cdT_{\mu(\lambda)\sigma} = \left[\left(1+s\frac{V_{\lambda\mu}}{c}\right)(cdT_{\lambda(\mu)\sigma}) + \left(g\frac{V_{\lambda\mu}}{c}\right)(dX_{\lambda(\mu)\sigma})\right]\Gamma_{\lambda\mu} \\ dX_{\mu(\lambda)\sigma} = \left[dX_{\lambda(\mu)\sigma} - \frac{V_{\lambda\mu}}{c}(cdT_{\lambda(\mu)\sigma})\right]\Gamma_{\lambda\mu} \end{cases}$$

- *Armenian inverse transformation equations of the observed σ particle's coordinates*

17_02

$$\begin{cases} cdT_{\lambda(\mu)\sigma} = \left[\left(1+s\frac{V_{\mu\lambda}}{c}\right)(cdT_{\mu(\lambda)\sigma}) + \left(g\frac{V_{\mu\lambda}}{c}\right)(dX_{\mu(\lambda)\sigma})\right]\Gamma_{\mu\lambda} \\ dX_{\lambda(\mu)\sigma} = \left[dX_{\mu(\lambda)\sigma} - \frac{V_{\mu\lambda}}{c}(cdT_{\mu(\lambda)\sigma})\right]\Gamma_{\mu\lambda} \end{cases}$$

- *The form of the Armenian quadratic interval expression, when from the λ and μ inertial systems observe the σ particle, where the constant coefficients s and g have two lower indexes denoting the observation systems*

17_03

$$\begin{cases} (d\tau_{\lambda(\mu)\sigma})^2 = \left(cdT_{\lambda(\mu)\sigma}\right)^2 + s_{\lambda\mu}\left(cdT_{\lambda(\mu)\sigma}\right)\left(dX_{\lambda(\mu)\sigma}\right) + g_{\lambda\mu}\left(dX_{\lambda(\mu)\sigma}\right)^2 > 0 \\ (d\tau_{\mu(\lambda)\sigma})^2 = \left(cdT_{\mu(\lambda)\sigma}\right)^2 + s_{\mu\lambda}\left(cdT_{\mu(\lambda)\sigma}\right)\left(dX_{\mu(\lambda)\sigma}\right) + g_{\mu\lambda}\left(dX_{\mu(\lambda)\sigma}\right)^2 > 0 \end{cases}$$

- *Meanwhile, in the above Armenian interval expressions, the constant coefficients s and g, according to (7_02) and (7_06), are symmetric coefficients*

17_04

$$\begin{cases} s_{\lambda\mu} = s_{\mu\lambda} \\ g_{\lambda\mu} = g_{\mu\lambda} \end{cases}$$

The Armenian Transformation Equations of a Moving Particle Coordinates Observe From the Inertial Systems λ and ν

- *Armenian direct transformation equations of the observed σ particle's coordinates*

$$\begin{cases} cdT_{\nu(\lambda)\sigma} = \left[\left(1+s\frac{V_{\lambda\nu}}{c}\right)(cdT_{\lambda(\nu)\sigma}) + \left(g\frac{V_{\lambda\nu}}{c}\right)(dX_{\lambda(\nu)\sigma})\right]\Gamma_{\lambda\nu} \\ dX_{\nu(\lambda)\sigma} = \left[dX_{\lambda(\nu)\sigma} - \frac{V_{\lambda\nu}}{c}(cdT_{\lambda(\nu)\sigma})\right]\Gamma_{\lambda\nu} \end{cases} \quad (17\_05)$$

- *Armenian inverse transformation equations of the observed σ particle's coordinates*

$$\begin{cases} cdT_{\lambda(\nu)\sigma} = \left[\left(1+s\frac{V_{\nu\lambda}}{c}\right)(cdT_{\nu(\lambda)\sigma}) + \left(g\frac{V_{\nu\lambda}}{c}\right)(dX_{\nu(\lambda)\sigma})\right]\Gamma_{\nu\lambda} \\ dX_{\lambda(\nu)\sigma} = \left[dX_{\nu(\lambda)\sigma} - \frac{V_{\nu\lambda}}{c}(cdT_{\nu(\lambda)\sigma})\right]\Gamma_{\nu\lambda} \end{cases} \quad (17\_06)$$

- *The form of the Armenian quadratic interval expression, when from the λ and ν inertial systems observe the σ particle, where the constant coefficients s and g have two lower indexes denoting the observation systems*

$$\begin{cases} (d\text{Ƃ}_{\lambda(\nu)\sigma})^2 = \left(cdT_{\lambda(\nu)\sigma}\right)^2 + s_{\lambda\nu}\left(cdT_{\lambda(\nu)\sigma}\right)\left(dX_{\lambda(\nu)\sigma}\right) + g_{\lambda\nu}\left(dX_{\lambda(\nu)\sigma}\right)^2 > 0 \\ (d\text{Ƃ}_{\nu(\lambda)\sigma})^2 = \left(cdT_{\nu(\lambda)\sigma}\right)^2 + s_{\nu\lambda}\left(cdT_{\nu(\lambda)\sigma}\right)\left(dX_{\nu(\lambda)\sigma}\right) + g_{\nu\lambda}\left(dX_{\nu(\lambda)\sigma}\right)^2 > 0 \end{cases} \quad (17\_07)$$

- *Meanwhile, in the above Armenian interval expressions, the constant coefficients s and g, similar to (17_04), are also symmetric coefficients*

$$\begin{cases} s_{\lambda\nu} = s_{\nu\lambda} \\ g_{\lambda\nu} = g_{\nu\lambda} \end{cases} \quad (17\_08)$$

The Armenian Transformation Equations of a Moving Particle Coordinates Observe From the Inertial Systems μ and ν

- *Armenian direct transformation equations of the observed σ particle's coordinates*

17_09

$$\begin{cases} cdT_{\nu(\mu)\sigma} = \left[\left(1+s\frac{V_{\mu\nu}}{c}\right)(cdT_{\mu(\nu)\sigma}) + \left(g\frac{V_{\mu\nu}}{c}\right)(dX_{\mu(\nu)\sigma})\right]\Gamma_{\mu\nu} \\ dX_{\nu(\mu)\sigma} = \left[dX_{\mu(\nu)\sigma} - \frac{V_{\mu\nu}}{c}(cdT_{\mu(\nu)\sigma})\right]\Gamma_{\mu\nu} \end{cases}$$

- *Armenian inverse transformation equations of the observed σ particle's coordinates*

17_10

$$\begin{cases} cdT_{\mu(\nu)\sigma} = \left[\left(1+s\frac{V_{\nu\mu}}{c}\right)(cdT_{\nu(\mu)\sigma}) + \left(g\frac{V_{\nu\mu}}{c}\right)(dX_{\nu(\mu)\sigma})\right]\Gamma_{\nu\mu} \\ dX_{\mu(\nu)\sigma} = \left[dX_{\nu(\mu)\sigma} - \frac{V_{\nu\mu}}{c}(cdT_{\nu(\mu)\sigma})\right]\Gamma_{\nu\mu} \end{cases}$$

- *The form of the Armenian quadratic interval expression, when from the μ and ν inertial systems observe the σ particle, where the constant coefficients s and g have two lower indexes denoting the observation systems*

17_11

$$\begin{cases} (d\bar{b}_{\mu(\nu)\sigma})^2 = \left(cdT_{\mu(\nu)\sigma}\right)^2 + s_{\mu\nu}\left(cdT_{\mu(\nu)\sigma}\right)\left(dX_{\mu(\nu)\sigma}\right) + g_{\mu\nu}\left(dX_{\mu(\nu)\sigma}\right)^2 > 0 \\ (d\bar{b}_{\nu(\mu)\sigma})^2 = \left(cdT_{\nu(\mu)\sigma}\right)^2 + s_{\nu\mu}\left(cdT_{\nu(\mu)\sigma}\right)\left(dX_{\nu(\mu)\sigma}\right) + g_{\nu\mu}\left(dX_{\nu(\mu)\sigma}\right)^2 > 0 \end{cases}$$

- *Meanwhile, in the above Armenian interval expressions, the constant coefficients s and g, similar to (17_04), are also symmetric coefficients*

17_12

$$\begin{cases} s_{\mu\nu} = s_{\nu\mu} \\ g_{\mu\nu} = g_{\nu\mu} \end{cases}$$

Quadratic Expressions of the Armenian Intervals Viewed Only From the One Observing System

- *Two quadratic expressions of the Armenian intervals for the same observed particle σ, observing from the inertial system λ*

$$\begin{cases} \left(d\text{ƃ}_{\lambda(\mu)\sigma}\right)^2 = \left(cdT_{\lambda(\mu)\sigma}\right)^2 + s_{\lambda\mu}\left(cdT_{\lambda(\mu)\sigma}\right)\left(dX_{\lambda(\mu)\sigma}\right) + g_{\lambda\mu}\left(dX_{\lambda(\mu)\sigma}\right)^2 > 0 \\ \left(d\text{ƃ}_{\lambda(\nu)\sigma}\right)^2 = \left(cdT_{\lambda(\nu)\sigma}\right)^2 + s_{\lambda\nu}\left(cdT_{\lambda(\nu)\sigma}\right)\left(dX_{\lambda(\nu)\sigma}\right) + g_{\lambda\nu}\left(dX_{\lambda(\nu)\sigma}\right)^2 > 0 \end{cases} \qquad 17\_13$$

- *Two quadratic expressions of the Armenian intervals for the same observed particle σ, observing from the inertial system μ*

$$\begin{cases} \left(d\text{ƃ}_{\mu(\lambda)\sigma}\right)^2 = \left(cdT_{\mu(\lambda)\sigma}\right)^2 + s_{\mu\lambda}\left(cdT_{\mu(\lambda)\sigma}\right)\left(dX_{\mu(\lambda)\sigma}\right) + g_{\mu\lambda}\left(dX_{\mu(\lambda)\sigma}\right)^2 > 0 \\ \left(d\text{ƃ}^2_{\mu(\nu)\sigma}\right)^2 = \left(cdT_{\mu(\nu)\sigma}\right)^2 + s_{\mu\nu}\left(cdT_{\mu(\nu)\sigma}\right)\left(dX_{\mu(\nu)\sigma}\right) + g_{\mu\nu}\left(dX_{\mu(\nu)\sigma}\right)^2 > 0 \end{cases} \qquad 17\_14$$

- *Two quadratic expressions of the Armenian intervals for the same observed particle σ, observing from the inertial system ν*

$$\begin{cases} \left(d\text{ƃ}_{\nu(\lambda)\sigma}\right)^2 = \left(cdT_{\nu(\lambda)\sigma}\right)^2 + s_{\nu\lambda}\left(cdT_{\nu(\lambda)\sigma}\right)\left(dX_{\nu(\lambda)\sigma}\right) + g_{\nu\lambda}\left(dX_{\nu(\lambda)\sigma}\right)^2 > 0 \\ \left(d\text{ƃ}_{\nu(\mu)\sigma}\right)^2 = \left(cdT_{\nu(\mu)\sigma}\right)^2 + s_{\nu\mu}\left(cdT_{\nu(\mu)\sigma}\right)\left(dX_{\nu(\mu)\sigma}\right) + g_{\nu\mu}\left(dX_{\nu(\mu)\sigma}\right)^2 > 0 \end{cases} \qquad 17\_15$$

- *According to the first postulate of the Armenian Special Theory of Time-Space it follows that the quadratic expressions of all the aforementioned Armenian intervals must be equal to each other*

$$\begin{cases} \underline{\text{Observed from system } K_\lambda} \rightarrow \left(d\text{ƃ}_{\xi}\right)^2 = \left(d\text{ƃ}_{\lambda(\mu)\sigma}\right)^2 = \left(d\text{ƃ}_{\lambda(\nu)\sigma}\right)^2 \\ \underline{\text{Observed from system } K_\mu} \rightarrow \left(d\text{ƃ}_{\xi}\right)^2 = \left(d\text{ƃ}_{\mu(\lambda)\sigma}\right)^2 = \left(d\text{ƃ}_{\mu(\nu)\sigma}\right)^2 \\ \underline{\text{Observed from system } K_\nu} \rightarrow \left(d\text{ƃ}_{\xi}\right)^2 = \left(d\text{ƃ}_{\nu(\lambda)\sigma}\right)^2 = \left(d\text{ƃ}_{\nu(\mu)\sigma}\right)^2 \end{cases} \qquad 17\_16$$

The Values of the Observed Particle's Coordinates are Independent of the Pairwise Observing Passive Systems

➤ *In the quadratic expressions of the Armenian intervals given in (17_13), the σ particle coordinates observed from the inertial observing system λ do not depend on the pairwise observing passive inertial systems μ or ν, therefore the following equalities take place*

17_17
$$\begin{cases} dT_{\lambda(\mu)\sigma} = dT_{\lambda(\nu)\sigma} := dT_{\lambda\sigma} \\ dX_{\lambda(\mu)\sigma} = dX_{\lambda(\nu)\sigma} := dX_{\lambda\sigma} \end{cases}$$

➤ *In the quadratic expressions of the Armenian intervals given in (17_14), the σ particle coordinates observed from the inertial observing system μ do not depend on the pairwise observing passive inertial systems λ or ν, therefore the following equalities take place*

17_18
$$\begin{cases} dT_{\mu(\lambda)\sigma} = dT_{\mu(\nu)\sigma} := dT_{\mu\sigma} \\ dX_{\mu(\lambda)\sigma} = dX_{\mu(\nu)\sigma} := dX_{\mu\sigma} \end{cases}$$

➤ *In the quadratic expressions of the Armenian intervals given in (17_15), the σ particle coordinates observed from the inertial observing system ν do not depend on the pairwise observing passive inertial systems λ or μ, therefore the following equalities take place*

17_19
$$\begin{cases} dT_{\nu(\lambda)\sigma} = dT_{\nu(\mu)\sigma} := dT_{\nu\sigma} \\ dX_{\nu(\lambda)\sigma} = dX_{\nu(\mu)\sigma} := dX_{\nu\sigma} \end{cases}$$

➤ *According to (17_04, 08,12), the coefficients s and g are symmetric quantities, therefore we have considered them as invariant quantities for those paired observing inertial systems*

17_20
$$\begin{cases} s_{\lambda\mu} = s_{\mu\lambda} \\ s_{\lambda\nu} = s_{\nu\lambda} \\ s_{\mu\nu} = s_{\nu\mu} \end{cases} \quad \text{and} \quad \begin{cases} g_{\lambda\mu} = g_{\mu\lambda} \\ g_{\lambda\nu} = g_{\nu\lambda} \\ g_{\mu\nu} = g_{\nu\mu} \end{cases}$$

In the Invariant Armenian Intervals Observed Particle Coordinates We Can Write Without Passive Observing Systems Indexes

- *The quadratic expressions of the Armenian invariant interval given in (17_13), according to (17_17), we can write without indexes of the passive observing inertial systems* μ *and* ν *as follows*

$$\left\{\begin{aligned} (d\text{Ե}_{\xi})^2 &= (cdT_{\lambda\sigma})^2 + s_{\lambda\mu}(cdT_{\lambda\sigma})dX_{\lambda\sigma} + g_{\lambda\mu}(dX_{\lambda\sigma})^2 \\ (d\text{Ե}_{\xi})^2 &= (cdT_{\lambda\sigma})^2 + s_{\lambda\nu}(cdT_{\lambda\sigma})dX_{\lambda\sigma} + g_{\lambda\nu}(dX_{\lambda\sigma})^2 \end{aligned}\right. \tag{17_21}$$

- *The quadratic expressions of the Armenian invariant interval given in (17_14), according to (17_18), we can write without indexes of the passive observing inertial systems* λ *and* ν *as follows*

$$\left\{\begin{aligned} (d\text{Ե}_{\xi})^2 &= (cdT_{\mu\sigma})^2 + s_{\mu\lambda}(cdT_{\mu\sigma})dX_{\mu\sigma} + g_{\mu\lambda}(dX_{\mu\sigma})^2 \\ (d\text{Ե}_{\xi})^2 &= (cdT_{\mu\sigma})^2 + s_{\mu\nu}(cdT_{\mu\sigma})dX_{\mu\sigma} + g_{\mu\nu}(dX_{\mu\sigma})^2 \end{aligned}\right. \tag{17_22}$$

- *The quadratic expressions of the Armenian invariant interval given in (17_15), according to (17_19), we can write without indexes of the passive observing inertial systems* λ *and* μ

$$\left\{\begin{aligned} (d\text{Ե}_{\xi})^2 &= (cdT_{\nu\sigma})^2 + s_{\nu\lambda}(cdT_{\nu\sigma})dX_{\nu\sigma} + g_{\nu\lambda}(dX_{\nu\sigma})^2 \\ (d\text{Ե}_{\xi})^2 &= (cdT_{\nu\sigma})^2 + s_{\nu\mu}(cdT_{\nu\sigma})dX_{\nu\sigma} + g_{\nu\mu}(dX_{\nu\sigma})^2 \end{aligned}\right. \tag{17_23}$$

- *From the invariant expressions of the above three pairs of Armenian intervals, it follows that between the coefficients* s *and* g*, there must exist the following equalities*

$$\left\{\begin{aligned} s_{\lambda\mu} &= s_{\lambda\nu} \\ s_{\mu\lambda} &= s_{\mu\nu} \\ s_{\nu\lambda} &= s_{\nu\mu} \end{aligned}\right. \quad \text{and} \quad \left\{\begin{aligned} g_{\lambda\mu} &= g_{\lambda\nu} \\ g_{\mu\lambda} &= g_{\mu\nu} \\ g_{\nu\lambda} &= g_{\nu\mu} \end{aligned}\right. \tag{17_24}$$

The Coefficients s and g are the Universal Constant Quantities

- *The relations between coefficients s given in (17_20) and (17_24) are written together*

17_25
$$\begin{cases} s_{\lambda\mu} = s_{\mu\lambda} \\ s_{\lambda\nu} = s_{\nu\lambda} \\ s_{\mu\nu} = s_{\nu\mu} \end{cases} \quad \text{and} \quad \begin{cases} s_{\lambda\mu} = s_{\lambda\nu} \\ s_{\mu\lambda} = s_{\mu\nu} \\ s_{\nu\lambda} = s_{\nu\mu} \end{cases}$$

- *The relations between coefficients g given in (17_20) and (17_24) are written together*

17_26
$$\begin{cases} g_{\lambda\mu} = g_{\mu\lambda} \\ g_{\lambda\nu} = g_{\nu\lambda} \\ g_{\mu\nu} = g_{\nu\mu} \end{cases} \quad \text{and} \quad \begin{cases} g_{\lambda\mu} = g_{\lambda\nu} \\ g_{\mu\lambda} = g_{\mu\nu} \\ g_{\nu\lambda} = g_{\nu\mu} \end{cases}$$

- *Jointly solving the above two system of relations, we will find that all coefficients of s are equal to each other and all coefficients of g are equal to each other, therefore they are universal constant quantities, because they do not depend on the choice of the observing inertial systems*

17_27
$$\begin{cases} s_{\lambda\mu} = s_{\lambda\nu} = s_{\nu\lambda} = s_{\nu\mu} = s_{\mu\nu} = s_{\mu\lambda} := s = \text{universal constant} \\ g_{\lambda\mu} = g_{\lambda\nu} = g_{\nu\lambda} = g_{\nu\mu} = g_{\mu\nu} = g_{\mu\lambda} := g = \text{universal constant} \end{cases}$$

Thus, we proved that the coefficients s and g are the universal constant quantities, which is a very important result. The only requirement is that the quadratic form of the Armenian interval must not be degenerated, and we hope that our universe in which we live is exactly that and the mathematical condition of its existence is as follows:

17_28
$$g \neq \tfrac{1}{4}s^2$$

Chapter 18

(Appendix 2)

Step by Step Demonstration of the Existence of a Crisis in the Legacy Theory of Relativity and Solution of the Armenian Theory of Time - Space

In the first and second volumes of our research work, as well as in this volume, if we use the term "Armenian Theory of Relativity", we assume that we have developed the legacy theory of relativity, making it a more generalized theory, obtaining more general transformations equations, obtaining more general transformation relations for velocities and accelerations, and so on. But getting more generalized equations and relations, we still remained within the frameworks, concepts and physical quantity notations of the legacy theory of relativity. Therefore, the crisis raised and voiced in the second volume of our research work was not due to an errors or incorrectness "Armenian Theory of Relativity", but the result of incorrect interpretations of the different physical quantities existing in the legacy theory of relativity and especially unsuccessful notations.

Formulas From This Third Volume in the Case of Reciprocal Observed Movement in Armenian Theory of Time - Space

- *Definitions of accelerations according to the Armenian Theory of Time-Space*

18_01

$$\text{Relative accelerations} \quad \begin{cases} A_{\lambda\mu} = \dfrac{dV_{\lambda\mu}}{dT_{\lambda\mu}} \\[2ex] A_{\mu\lambda} = \dfrac{dV_{\mu\lambda}}{dT_{\mu\lambda}} \end{cases} \quad \text{and} \quad \text{Particle's accelerations} \quad \begin{cases} B_{\lambda\sigma} = \dfrac{dU_{\lambda\sigma}}{dT_{\lambda\sigma}} \\[2ex] B_{\mu\sigma} = \dfrac{dU_{\mu\sigma}}{dT_{\mu\sigma}} \end{cases}$$

- *Armenian relations between reciprocal observed times of the systems, given in (10_07)*

18_02

$$\begin{cases} dT_{\lambda\mu} = \left(1 + s\dfrac{V_{\mu\lambda}}{c}\right) dT_{\mu\lambda} \\[2ex] dT_{\mu\lambda} = \left(1 + s\dfrac{V_{\lambda\mu}}{c}\right) dT_{\lambda\mu} \end{cases}$$

- *Reciprocal relations between Armenian gamma coefficients of transformation, given in (12_05)*

18_03

$$\begin{cases} \Gamma(V_{\lambda\mu}) = \Gamma(V_{\mu\lambda})\left(1 + s\dfrac{V_{\mu\lambda}}{c}\right) \\[2ex] \Gamma(V_{\mu\lambda}) = \Gamma(V_{\lambda\mu})\left(1 + s\dfrac{V_{\lambda\mu}}{c}\right) \end{cases}$$

- *Armenian transformations of relative velocities and accelerations, given in (8_08) and (11_22)*

18_04

$$\begin{cases} V_{\lambda\mu} = -\dfrac{V_{\mu\lambda}}{1 + s\dfrac{V_{\mu\lambda}}{c}} \\[3ex] V_{\mu\lambda} = -\dfrac{V_{\lambda\mu}}{1 + s\dfrac{V_{\lambda\mu}}{c}} \end{cases} \Rightarrow \begin{cases} A_{\lambda\mu} = -\dfrac{A_{\mu\lambda}}{\left(1 + s\dfrac{V_{\mu\lambda}}{c}\right)^3} \\[3ex] A_{\mu\lambda} = -\dfrac{A_{\lambda\mu}}{\left(1 + s\dfrac{V_{\lambda\mu}}{c}\right)^3} \end{cases}$$

Formulas From This Third Volume in the Case of Observation the Movement of Particle in the Armenian Theory of Time - Space

- *According to (8_05), (12_03) and (14_17) we obtain the relations of the particle's observed times*

$$\begin{cases} \dfrac{dT_{\lambda\sigma}}{dT_{\mu\sigma}} = \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}\right)\Gamma(V_{\mu\lambda}) = \dfrac{\Gamma(U_{\lambda\sigma})}{\Gamma(U_{\mu\sigma})} \\ \dfrac{dT_{\mu\sigma}}{dT_{\lambda\sigma}} = \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}\right)\Gamma(V_{\lambda\mu}) = \dfrac{\Gamma(U_{\mu\sigma})}{\Gamma(U_{\lambda\sigma})} \end{cases} \tag{18_05}$$

- *When from the same system we observe two other different systems, then according to (10_25) and (12_01,09), there are relations between corresponding observing times, whose equivalent relations in legacy theory of relativity simply do not exist because of unsuccessful notations of physical quantities*

$$\begin{cases} \dfrac{dT_{\lambda\sigma}}{\Gamma(U_{\lambda\sigma})} = \dfrac{dT_{\lambda\mu}}{\Gamma(V_{\lambda\mu})} \\ \dfrac{dT_{\mu\sigma}}{\Gamma(U_{\mu\sigma})} = \dfrac{dT_{\mu\lambda}}{\Gamma(V_{\mu\lambda})} \end{cases} \Rightarrow \begin{cases} \dfrac{dT_{\lambda\mu}}{dT_{\lambda\sigma}} = \dfrac{\Gamma(V_{\lambda\mu})}{\Gamma(U_{\lambda\sigma})} \\ \dfrac{dT_{\mu\lambda}}{dT_{\mu\sigma}} = \dfrac{\Gamma(V_{\mu\lambda})}{\Gamma(U_{\mu\sigma})} \end{cases} \tag{18_06}$$

- *Armenian transformation relations of the particle’s velocities, given in (8_06)*

$$\begin{cases} \dfrac{U_{\lambda\sigma}}{c} = \dfrac{\dfrac{U_{\mu\sigma}}{c} - \dfrac{V_{\mu\lambda}}{c}}{1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}} \\ \dfrac{U_{\mu\sigma}}{c} = \dfrac{\dfrac{U_{\lambda\sigma}}{c} - \dfrac{V_{\lambda\mu}}{c}}{1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}} \end{cases} \tag{18_07}$$

- *The derivatives of the above Armenian transformation relations of the particle velocities, with respect to the corresponding observed times*

$$\begin{cases} \left(\dfrac{dT_{\lambda\sigma}}{dT_{\mu\sigma}}\right)\dfrac{dU_{\lambda\sigma}}{dT_{\lambda\sigma}} = \dfrac{d}{dT_{\mu\sigma}}\left(\dfrac{U_{\mu\sigma} - V_{\mu\lambda}}{1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda}U_{\mu\sigma}}{c^2}}\right) \\ \left(\dfrac{dT_{\mu\sigma}}{dT_{\lambda\sigma}}\right)\dfrac{dU_{\mu\sigma}}{dT_{\mu\sigma}} = \dfrac{d}{dT_{\lambda\sigma}}\left(\dfrac{U_{\lambda\sigma} - V_{\lambda\mu}}{1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu}U_{\lambda\sigma}}{c^2}}\right) \end{cases} \tag{18_08}$$

Reciprocal Observed Motion Formulas in The Armenian Theory of Relativity, From the Second Volume of Our Work

- *Definitions of the acceleration according to the legacy theory of relativity*

18_09

Relative accelerations

$$\begin{cases} a = \dfrac{dv}{dt} \\ a' = \dfrac{dv'}{dt'} \end{cases}$$

and

Particle's accelerations

$$\begin{cases} b = \dfrac{du}{dt} \\ b' = \dfrac{du'}{dt'} \end{cases}$$

18_10

In the legacy theory of relativity, the concepts and notations of the reciprocal observed times is not clear and therefore the relations between them are not understood and it is easily confused with the observed times of the moving particle or observing systems own (proper) times, which results in confusion and crisis.

- *Reciprocal relations between Armenian gamma coefficients of transformation in Armenian Theory of Relativity*

18_11

$$\begin{cases} \gamma(v) = \gamma(v')\left(1+s\dfrac{v'}{c}\right) \\ \gamma(v') = \gamma(v)\left(1+s\dfrac{v}{c}\right) \end{cases}$$

- *Armenian transformation relations of relative velocities in Armenian Theory of Relativity*

18_12

$$\begin{cases} v = -\dfrac{v'}{1+s\dfrac{v'}{c}} \\ v' = -\dfrac{v}{1+s\dfrac{v}{c}} \end{cases}$$

Formulas From Our Second Volume in the Case of Observing the Movement of Particle in the Armenian Theory of Relativity

- *The relations between the particle's Armenian gamma coefficients in Armenian Theory of Relativity*

$$\begin{cases} \gamma(u) = \left(1 + s\frac{v'}{c} + g\frac{v'u'}{c^2}\right)\gamma(v')\gamma(u') \\ \gamma(u') = \left(1 + s\frac{v}{c} + g\frac{vu}{c^2}\right)\gamma(v)\gamma(u) \end{cases}$$

18_13

- *The relations between the particle's observed times in Armenian Theory of Relativity*

$$\begin{cases} \dfrac{dt}{dt'} = \left(1 + s\frac{v'}{c} + g\frac{v'u'}{c^2}\right)\gamma(v') = \dfrac{\gamma(u)}{\gamma(u')} \\ \dfrac{dt'}{dt} = \left(1 + s\frac{v}{c} + g\frac{vu}{c^2}\right)\gamma(v) = \dfrac{\gamma(u')}{\gamma(u)} \end{cases}$$

18_14

- *Armenian transformation relations of the particle’s velocities in Armenian Theory of Relativity*

$$\begin{cases} u = \dfrac{u' - v}{1 + s\frac{v'}{c} + g\frac{v'u'}{c^2}} \\ u' = \dfrac{u - v}{1 + s\frac{v}{c} + g\frac{vu}{c^2}} \end{cases}$$

18_15

- *The derivatives of the above Armenian transformation relations of the particle velocities, with respect to the corresponding observed times in Armenian Theory of Relativity*

$$\begin{cases} \left(\dfrac{dt}{dt'}\right)\dfrac{du}{dt} = \dfrac{d}{dt'}\left(\dfrac{u' - v'}{1 + s\frac{v'}{c} + g\frac{v'u'}{c^2}}\right) \\ \left(\dfrac{dt'}{dt}\right)\dfrac{du'}{dt'} = \dfrac{d}{dt}\left(\dfrac{u - v}{1 + s\frac{v}{c} + g\frac{vu}{c^2}}\right) \end{cases}$$

18_16

Relations Between Relative Accelerations in Armenian Theory of Relativity

- *Differentiating the right side expressions given in (18_16) and replacing the velocity derivatives with the corresponding accelerations, we obtain the following expressions*

18_17

$$\begin{cases} \left(\dfrac{dt}{dt'}\right)b = \dfrac{1}{[\gamma(v')]^2\left(1+s\dfrac{v'}{c}+g\dfrac{v'u'}{c^2}\right)^2}\left\{b' - \dfrac{[\gamma(v')]^2}{[\gamma(u')]^2}a'\right\} \\ \left(\dfrac{dt'}{dt}\right)b' = \dfrac{1}{[\gamma(v)]^2\left(1+s\dfrac{v}{c}+g\dfrac{vu}{c^2}\right)^2}\left\{b - \dfrac{[\gamma(v)]^2}{[\gamma(u)]^2}a\right\} \end{cases}$$

- *Applying the expressions given in (18_14) into both sides of the above mentioned relations, we obtain the following transformation relations for observed particle accelerations*

18_18

$$\begin{cases} \dfrac{\gamma(u)}{\gamma(u')}b = \dfrac{[\gamma(u')]^2}{[\gamma(u)]^2}\left\{b' - \dfrac{[\gamma(v')]^2}{[\gamma(u')]^2}a'\right\} \\ \dfrac{\gamma(u')}{\gamma(u)}b' = \dfrac{[\gamma(u)]^2}{[\gamma(u')]^2}\left\{b - \dfrac{[\gamma(v)]^2}{[\gamma(u)]^2}a\right\} \end{cases}$$

- *Simplifying the above relations, for particle acceleration transformations, we will obtain the following relations*

18_19

$$\begin{cases} [\gamma(u)]^3 b = [\gamma(u')]^3 b' - \gamma(u')[\gamma(v')]^2 a' \\ [\gamma(u')]^3 b' = [\gamma(u)]^3 b - \gamma(u)[\gamma(v)]^2 a \end{cases}$$

- *Adding the above transformation relations for particle accelerations, we obtain the relations of relative accelerations between non-inertial observing systems*

18_20

$$\gamma(u)[\gamma(v)]^2 a + \gamma(u')[\gamma(v')]^2 a' = 0$$

Demonstration of the Existence of a Crisis in the Legacy Theory of Relativity

➢ *The relations between relative accelerations given in (18_20) can be written also as follows*

$$\begin{cases} \gamma(u)[\gamma(v)]^2 a = -\gamma(u')[\gamma(v')]^2 a' \\ \gamma(u')[\gamma(v')]^2 a' = -\gamma(u)[\gamma(v)]^2 a \end{cases}$$ 18_21

➢ *Applying all the necessary relations given in (18_11,13) into the above-mentioned relations, we obtain the following transformation relations for relative accelerations, according to the interpretation of the Armenian Theory of Relativity*

$$\begin{cases} a = -\dfrac{1}{\gamma(v')\left(1+s\frac{v'}{c}\right)^2\left(1+s\frac{v'}{c}+g\frac{v'u'}{c^2}\right)}a' \\ a' = -\dfrac{1}{\gamma(v)\left(1+s\frac{v}{c}\right)^2\left(1+s\frac{v}{c}+g\frac{vu}{c^2}\right)}a \end{cases}$$ 18_22

➢ *By placing $s = 0$ and $g = -1$ in the above-mentioned relative accelerations transformation relations, we obtain the transformation relations according to the legacy theory of relativity*

$$\begin{cases} a = -\dfrac{a'}{\gamma(v')\left(1-\frac{v'u'}{c^2}\right)} \\ a' = -\dfrac{a}{\gamma(v)\left(1-\frac{vu}{c^2}\right)} \end{cases}$$ 18_23

The relative accelerations that exists between reciprocal observing non-inertial systems may depend only on the velocity and acceleration of the reciprocal system, but never on the velocity (u or u prime) of any arbitrarily chosen observed particle. The above formulas illustrate the existence of a deep crisis in the legacy theory of relativity, which was the result of a misinterpretation of the concept of "observed time" and the usage of very unsuccessful notations, which became the biggest and unrecoverable catastrophe of the legacy theory of special relativity. 18_24

Transformation Relations of Relative Accelerations in the Armenian Theory of Time - Space

- *By differentiating the right sides of the expressions given in (18_08), and then by substituting the left sides corresponding relations of the particle's observed times given in (18_05) and also replacing the derivatives of velocities with corresponding accelerations, we obtain*

18_25

$$\begin{cases} \dfrac{\Gamma(U_{\lambda\sigma})}{\Gamma(U_{\mu\sigma})} B_{\lambda\sigma} = \dfrac{1}{[\Gamma(V_{\mu\lambda})]^2 \left(1 + s\dfrac{V_{\mu\lambda}}{c} + g\dfrac{V_{\mu\lambda} U_{\mu\sigma}}{c^2}\right)^2} \left\{ B_{\mu\sigma} - \dfrac{[\Gamma(V_{\mu\lambda})]^2}{[\Gamma(U_{\mu\sigma})]^2} \dfrac{dT_{\mu\lambda}}{dT_{\mu\sigma}} A_{\mu\lambda} \right\} \\ \dfrac{\Gamma(U_{\mu\sigma})}{\Gamma(U_{\lambda\sigma})} B_{\mu\sigma} = \dfrac{1}{[\Gamma(V_{\lambda\mu})]^2 \left(1 + s\dfrac{V_{\lambda\mu}}{c} + g\dfrac{V_{\lambda\mu} U_{\lambda\sigma}}{c^2}\right)^2} \left\{ B_{\lambda\sigma} - \dfrac{[\Gamma(V_{\lambda\mu})]^2}{[\Gamma(U_{\lambda\sigma})]^2} \dfrac{dT_{\lambda\mu}}{dT_{\lambda\sigma}} A_{\lambda\mu} \right\} \end{cases}$$

- *On the right side of the above relations again by applying all the necessary relations given in (18_05,06), for the transformation of particle accelerations we obtain the following relations*

18_26

$$\begin{cases} \dfrac{\Gamma(U_{\lambda\sigma})}{\Gamma(U_{\mu\sigma})} B_{\lambda\sigma} = \dfrac{[\Gamma(U_{\mu\sigma})]^2}{[\Gamma(U_{\lambda\sigma})]^2} \left\{ B_{\mu\sigma} - \dfrac{[\Gamma(V_{\mu\lambda})]^3}{[\Gamma(U_{\mu\sigma})]^3} A_{\mu\lambda} \right\} \\ \dfrac{\Gamma(U_{\mu\sigma})}{\Gamma(U_{\lambda\sigma})} B_{\mu\sigma} = \dfrac{[\Gamma(U_{\lambda\sigma})]^2}{[\Gamma(U_{\mu\sigma})]^2} \left\{ B_{\lambda\sigma} - \dfrac{[\Gamma(V_{\lambda\mu})]^3}{[\Gamma(U_{\lambda\sigma})]^3} A_{\lambda\mu} \right\} \end{cases}$$

- *From the above relations, we obtain the Armenian transformation relations of the accelerations*

18_27

$$\begin{cases} [\Gamma(U_{\lambda\sigma})]^3 B_{\lambda\sigma} = [\Gamma(U_{\mu\sigma})]^3 B_{\mu\sigma} - [\Gamma(V_{\mu\lambda})]^3 A_{\mu\lambda} \\ [\Gamma(U_{\mu\sigma})]^3 B_{\mu\sigma} = [\Gamma(U_{\lambda\sigma})]^3 B_{\lambda\sigma} - [\Gamma(V_{\lambda\mu})]^3 A_{\lambda\mu} \end{cases}$$

- *Adding the above transformation relations for particle accelerations, we obtain the relations of relative accelerations between non-inertial observing systems*

18_28

$$[\Gamma(V_{\lambda\mu})]^3 A_{\lambda\mu} + [\Gamma(V_{\mu\lambda})]^3 A_{\mu\lambda} = 0$$

- *By substituting into the relative accelerations relations given in (18_28) with Armenian gamma coefficients reciprocal relations given in (18_03), we will obtain the particle's relative accelerations initial transformation relations given in (18_04), which shows that there is no contradiction in the Armenian Theory of Time-Space*

$$\begin{cases} A_{\lambda\mu} = -\dfrac{A_{\mu\lambda}}{\left(1+s\dfrac{V_{\mu\lambda}}{c}\right)^3} \\ A_{\mu\lambda} = -\dfrac{A_{\lambda\mu}}{\left(1+s\dfrac{V_{\lambda\mu}}{c}\right)^3} \end{cases} \qquad \text{18\_29}$$

- *But in the legacy theory of relativity, between transformation relations of the relative acceleration, take place the following absurd relations, because they also contain the velocities of an arbitrary particle*

Transformation relations in Armenian Theory of Relativity		Transformation relations in legacy theory of relativity
$\begin{cases} a = -\dfrac{1}{\gamma(v')\left(1+s\frac{v'}{c}\right)^2\left(1+s\frac{v'}{c}+g\frac{v'u'}{c^2}\right)}a' \\ a' = -\dfrac{1}{\gamma(v)\left(1+s\frac{v}{c}\right)^2\left(1+s\frac{v}{c}+g\frac{vu}{c^2}\right)}a \end{cases}$	$\Rightarrow$	$\begin{cases} a = -\dfrac{a'}{\gamma(v')\left(1-\frac{v'u'}{c^2}\right)} \\ a' = -\dfrac{a}{\gamma(v)\left(1-\frac{vu}{c^2}\right)} \end{cases}$

18_30

As we can see, the observed particle relative accelerations in the "Armenian Theory of Time-space", according to (18_29), depend only on the reciprocal observed relative velocities and relative accelerations. And the legacy theory of relativity does not satisfy this natural requirement, because the observed particle relative accelerations transformation relations given in (18_30) also depend on the velocities of the arbitrary moving observed particle. The reason for this error is the incorrect interpretation on the concept of "observed time" and very unsuccessful notations.
The same result could also be obtained in a shorter way, by first deriving Armenian transformation relations of the relative velocities given in (18_12), and then using the relations of reciprocal observed times given in (18_14). But we have chosen the long way, because we also prefer getting the particle accelerations transformation relations in the Armenian Theory of Relativity.

18_31

The Armenian Revolution in Science Continues

We called this third volume of our research work "Armenian Special Theory of Time-Space", which best describes the very essence of our theory. The term "special" means that in this volume mainly discusses the case when observing systems are inertial systems (of course, with the Armenian interpretation). In addition, in this third volume, we have recognized that all observing and observed systems have the same "weight", that is in some sense, all systems are equivalent to each other. And what this means will become clear in the following volumes.

By re-interpreting some very important concepts in the "Armenian Special Theory of Time-Space", such as “observed time” and “own time”, we were able to solve the nested crisis in the legacy theory of relativity, which been revealed in our second volume. We also outline the way to solve the problem of particle system movement as whole.

We have also proved that "Armenian Special Theory of Time-Space" is rich in fine and difficult to grasp concepts, in many cases unexpected ideas and interpretations that are contrary to traditional physics perceptions and experiences. In our illustrated book, intended for wide circles, using only pure mathematical approach, we have been able to provide a new scientific breakthrough in the interpretation of the concepts of time and space, and have paved the way for the construction of the most general and unified theory.

The "Armenian Special Theory of Time-Space" is mathematically so solid and perfect that it can't be wrong. Therefore, our derived Armenian Transformation Equations and all other Armenian Relativistic Formulas should not only replace Lorentz transformation equations or other legacy relativistic relations, but all modern theoretical physics must be rewritten again. Because the transformation equations and other formulas of legacy theory of relativity, are only a very special case of our derived formulas in Armenian Special Theory of Time-Space, when $s = 0$ and $g = -1$.

The many transformation equations and many other important relations contained in this volume are presented very briefly, with almost no strong proofs, and readers must make sufficient effort to verify for themselves the derivation of all our transformation equations and relativistic formulas.

And finally, in this third volume of our research work, you will come across amazing interpretations and see new beautiful formulas that the World has never seen before and these mathematical formulas are capable of reforming the future of mankind by creating a new golden age of scientific breakthroughs, free from all types of spiritual, mental and physical leprosy.

Long Live the Revival of Armenian Science!

Long Live the Armenian Revolution in Science!

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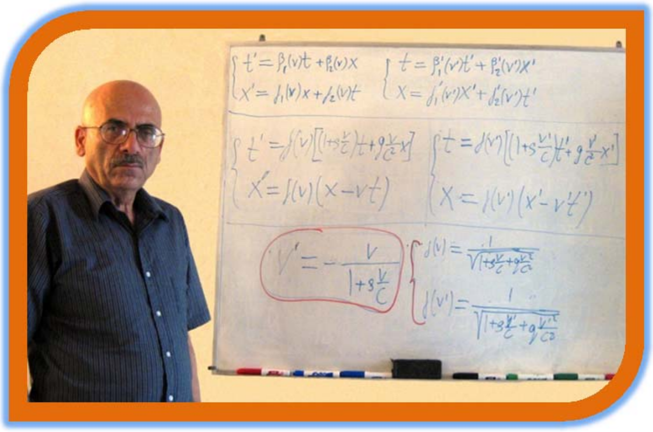

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ISBN 978-9939-0-3130-9

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