CHOREOLOGY AS A FIELD OF INTERDISCIPLINARY RESEARCH

(Choreography and Natural Sciences)

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In the process of establishing interdisciplinary connections between choreography/choreology, which is the main goal of our research, the most common form is the study of art sciences between choreography and musicology, art history, theater studies and, to a lesser extent, literary studies. In addition, the connection between choreography/choreology and non-artistic fields is interesting. Its boundaries have greatly expanded, and this field of art, which is very common to us, has been given an unusual hue. The first task of research was to see a unified picture of this scale, for which we needed to find a unified classifier of scientific fields—no easy task, since there is no unified classifier of sciences and they are differentiated according to different principles and needs. Therefore, it was necessary to develop a general list of scientific fields based on the proposed options, which would be tailored to suit our research objectives and reflect links to choreography/choreology. Classification is sorted as follows:

humanitarian sciences	Philosophy
	Philology/Linguistics
	History
	Archeology/Paleochoreography[1]
	Religion/Mythology/Theology
	Local lore
	Culturology
	Art Art History Theater Studies Musicology Choreology Literary Studies Film Studies
Social Sciences	Anthropology
	Ethnography/Ethnology
	Sociology/Studies
	Psychology
	Informatics/Computer Technologies
	Pedagogy
	Library Studies
Natural Sciences	Mathematics: Algebra/Geometry
	Physics/Applied Mechanics
	Medicine/Art Therapy/Traumatology/ Ethnogenesis/Folk Medicine
	Biology/Anatomy/Neurobiology/Ethology
	Astronomy/Cosmology/Astrophysics
	Geography

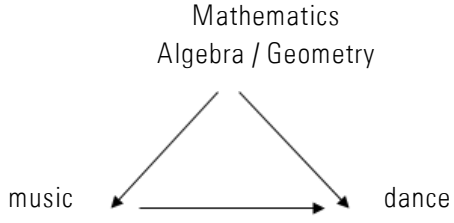
1 Ромм В. В. “ Палеохореография“ https://cyberleninka.ru/article/n/v-v-romm-paleohoreografiya

The list is extensive and creates a very interesting picture from the perspective of choreology research. As part of our research, we want to introduce just one lesser-known segment of the subject, the connection between choreography/choreology/dance and natural sciences: mathematics, physics, medicine, and biology.

DANCE AND MATHEMATICS

When we made the association between dance and mathematics, two directions emerged: dance's ties to numbers and geometric figures. In the first case, the study focused on the metro-rhythmic structure of dance (the question of the number of periodic stretches in dance time), and on the other hand, the drawing of dance (spatial drawing of the dance, both horizontally—onstage and vertically—in body shapes).

The Pythagoreans saw the model of the universe in the connection between mathematics and music. For our part, we will try to find an algebraic connection between dance and music and find common intersections of geometry and dance.



Dance and Algebra (Arithmetic). Basic mathematics includes several subfields, including elementary algebra (arithmetic), elementary geometry (planimetry, stereometry). In the field of arithmetic, the length of notes is used in music, at the same time representing the names of fractions, for example, whole, half-1/2, quarter-1/4, eighth-1/8, and so on. The sequence of strong and weak beats determines the musical size on which the shape of the musical material and the type of composition depend. Rhythm, which we often learn through percussion instruments, in turn helps us to count music and use mathematical units to do so. Counting is a means of organizing dance movement and connecting it to music.

The parts of said triad (mathematics (arithmetic)/music/dance) are somewhat similar. For example, we can count on a musical note and perform a certain dance movement on that count.[2] By arranging a few notes on top of each other, during which there will be a musically logical line or otherwise a melody section, we will get a musical tact, to a certain extent. By arranging a few beats on top of each other we get a musical phrase, then a sentence, then a fragment and, finally, a complete musical work. We meet a similar algorithm in dance: one movement joins another, it turns into a dance combination, then into a fragment, and as a result we get a dance phrase.

With regard to folklore, when you see the whole picture, we have to apply this fourth part, literature, or rather, verse. Here, too, rhythm prevails to becomes the binder of all components. In folk dance pieces there is a group of special importance (which confirms the archaic origin of choreography), which we call Perkhuli with its round dance structure including three essential components: verse-music-movement, the unifying, connecting element of which is exactly that rhythm.

Dance and Geometry. Elements of geometric figures are clearly visible in the movements of classical dance exercises. For example, if we look at Demi and Grand plie, we will see that legs take the shape of a moving rhombus and a rectangle. The concept of degrees introduced by F. Stefanov determines the exact height in the air. A leg raised at 90 degrees forms a rectangle, and its angle changes or decreases when it is raised or lowered. Rond de jambe par terre is a clear example of circular shapes in classical dance movements. In the positions of arms, we can clearly see the graphic functions in the form of a parabola.[3] If we look at the movements of folk dances with a "geometric gaze," we will see different geometric figures in all nations, including Georgian dances. Even in dance drawings, which we call dance ornaments, the worldviews of different ethnic groups are reflected.

Symmetry and asymmetry. The human body is usually built on the principle of symmetry and proportion, and therefore its various states in dance are largely

2 The similarity-peculiarity of musical and choreographic scores (counts) is a very important issue and needs independent research. Which, we hope, will be reflected in our final dissertation.

3 Практическое применение тригонометрии-2019 https://multiurok.ru/files/prakticheskoe-primenenie-trigonometrii-10-klass.html

symmetrical. For example, symmetry, or the equal, synchronous position of the limbs, is the primary task in creating dancing positions with arms and feet. Symmetry can also be called the movements performed simultaneously by the dancers. Also, the symmetrical layout of the dance drawing in the dance space is very important. For a variety of choreographic compositions, it is advisable to use the opposite method of asymmetry or asymmetry. It has its own visual and psycho-emotional load. When constructing dance targets, choreographers often resort to the variation of symmetry-asymmetric drawings, which makes the choreographic spectacle more interesting.

One of the connecting threads of geometry and art is the golden mean,[4] a unique phenomenon considered to be an analogy of proportion and harmony. The structure of the human body, paintings, architectural structures, literary and, apparently, musical works, all contain the principles of golden carving. In choreography it may be considered, on one hand, in terms of the plastic outline of the human body as the "building" material of choreography, in terms of the study of perfect shapes of the moving body, and, on the other hand, in terms of psycho-emotional impact on the viewer. Unequivocally, we consider this issue as a separate research topic and, we hope, it will be given due attention as well.

Perpendiculars and parallels. The vertical position of a person in relation to the dance floor and all the dance actions that will be performed in this position will be considered perpendicular. It is not difficult to find parallel states in dance either. In addition to the rows and dance positions in the drawing, we also see it in the dance of the partners. Parallelism also means synchronous performance. One of the examples of parallelism of the dancer's body is a split, which ends both on the floor and in the air. Grand jeté can also be considered an ideal jump if the spread of both feet parallel to the floor during its performance.

Full point. It can be understood in many ways in dance. For example: dancer body points, equilibrium point, dance movement point, rotation point, compositional points in the dance space, and the like. A full point is a punctuation mark in literature, and is written at the end of a narrative sentence if that sentence is intellectually complete. Choreography, like literature, speaks its "language" and in itself has its suggestions. Every dance move, phrase, combination or composition has the property of ending or continuing again. The completion of a choreographic section can be called a choreographic full point.

In mathematics, any geometric figure is considered to be composed of points. Each dancer in the graphic image of the dance drawing can be considered a point. It is by fixing these points and their movement, a sequence of static and dynamic images, that a dance drawing is created. During the construction of a separate mise-en-scene of the choreographic composition, the dance floor and the space are divided by marking different points (8 points).

Since we have described dance in drawing and the role of dots in it, we want to look at another issue. The subfields of geometry are planimetry and stereometry. Planimetry studies the figures given on a plane, while stereometry studies the properties of geometric figures in space. Dancing drawing in choreography is one of the means of expression. It is fixed with conditional marks on a sheet or flat surface. Therefore, fixing a dance drawing can also be called choreographic planimetry.

The ability of a dancer to stop looking at a specific point helps him to perform different turns. The absolute sensation of the body brings a person to a point of equilibrium. According to the law of attraction, the dancer uses different points as a support, both vertically and horizontally.

To summarize, physics is considered to be an adjacent science of mathematics, and then it would be natural to move from mathematics to physics in the next chapter, in search of logical connections with the natural sciences of choreographic art.

DANCE AND PHYSICS

One of the natural and technical subjects in the field of physics is mechanics, which studies the motion of bodies and the forces acting on them during that motion. Mechanics based on Newton's laws is known as classical mechanics. We note here that almost all of

4 Бендукидзе А. , „Золотое сечение" Научно-популярный физико-математический журнал»Квант» 1973г.N8 http://kvant.mccme.ru/1973/08/zolotoe_sechenie.htm

Newton's laws relating to the motion of bodies can be jokingly referred to as the "dance laws of physics."

Another field of physics, astrophysics, which in itself is one of the directions of astronomy, can be associated with dance folklore bearing the signs of the astral cult of ritualistic nature.

The terms of physics: mechanics, space, time, kinetics, dynamics, statics, gravity are used quite naturally in choreography. For example, one of the prerequisites for performing a dance pattern is the presence of a stage (or any other) space. Also, each dance action requires a specific period of time and, consequently, each choreographic piece includes timing (duration). a dance movement can be dynamic or moving, or static, real. These two properties of mechanics or movement create a variety of dance compositions, both movement and drawing.

On the law of gravity and gravity, we can undoubtedly say that these physical events help us to perform difficult acrobatic tricks, jumps or so-called performing "tricks."

DANCE AND MEDICINE

Medicine can be divided into two directions: traditional and folk medicine.

Traditional medicine accompanies the professional life of a dancer in case of physical damage to the body. A dancer is always at risk of getting injured. Sports traumatology has come a long way in this regard and there is a lot of work on this issue. It would not be wrong for all dance teachers to follow the advice of traumatologists and build all parts of a dance lesson in such a way as to avoid various types of bodily injuries in the future. We rarely see such studies in choreography, and Georgian choreography has not been discussed in this regard at all. It would be interesting to hear the advice of professionals on this issue.

Folk medicine is very interestingly revealed in Georgian folk choreography. The ancient tradition of medicine, originating in the Colchian period, does not lose its relevance in the Georgian folk life, along with the variability of different periods. Literary or oral sources, folk customs, often convey dance-singing rituals to be performed for the treatment of epidemic disease, such as Batonebi, Lullaby, Apology, and many others[5]

In modern life, "dance treatment" is called art therapy. In 1966, the Dance Psychotherapy Association was formed in America. The work of the clinic was based on the practice of Marion Chase, a dancer and dance teacher. He initially observed his student dancers who, instead of dancing techniques, were interested in expressing the nature of feelings directly through dance. Subsequently, his studies became interested in psychologists and psychotherapists who referred mentally ill patients to him for treatment. As a result of dance therapy, psychologists were able to achieve positive results with patients.[6] It is in this context that we find one of the vectors of the relationship between dance and psychology.

DANCE AND BIOLOGY

Study shows that the connection between choreography/choreology and the related natural sciences of medicine, such as anatomy, neurobiology, and zoology-ethology, is combined with the study of biology.

Dance and Anatomy. One of the main "building blocks" of dance is the human body: bone system, joints, muscles, and more. The methodology of studying classical dance, which is the beginning of all kinds of choreography, builds on the characteristics of the human body. The sequence of movements in an exercise is not accidental. All movements follow each other logically and with anatomical accuracy. Classical dance methodologists strongly advocate adhering to the sequence of "warm-up" exercises or the structural build-up of a lesson.

To study the anatomy of dance, we must turn to the synthesis of physics and biology, the natural field of biomechanics, a branch of biology and, today, the main direction of kinesiology. To refer to dance as a mechanical phenomenon, the appropriate term was found in the early 20th century. The first to address this issue was Austrian dancer, teacher, and theorist Rudolf von Laban. He officially presented the book Choreography

5 გვარამაძე ლ. „ქართული საცეკვაო ფოლკლორი" თბ.1997წ.

6 **Танце-двигательная терапия** https://works.doklad.ru/view/LETnUG_ksTg.html

at the Second Dance Congress in Germany in 1928, calling the method of motion analysis cinetography[7], also known as Laban cinematography.[8] Later in 1940, famous researcher of choreographic folklore Srbui Lisitsyan developed his own system of recording dance movements, through which it was possible to record with mathematical precision the position of the body in space, movements, dance goals and theatrical performances. Lisitsiani calls the published work dance recording (Kinetography).[9]

Dance and Neurobiology. In an experiment conducted at Albert Einstein Medical College in New York, scientists found that dancing slows down the aging process of the brain.[10] It restores neural pathways, leading to neuroplasticity of the brain. Your own intelligence is measured in situations where a quick response is required. We often meet such moments in dance. During a dance, decisions are made in hundredths of seconds: acceleration of movement with acceleration of tempo, perception of rhythm variability, memorization and improvisation of a variety of dance combinations and drawings (the method of frequent variability of combinations is actively used in the classical dance lesson).

Dance and Ethology. Ethology studies the genetically formed instincts and behaviors of animals and humans, and may be considered an ancillary science in the study of dance genesis. It is interesting that the motif of the fauna performs various actions which scientists call "dance."

Among the most interesting studies is the "dance of bees" discovered by German scientist Karl von Frisch.[11] The activities of different species of fish are known as "wedding dances." There are snake dances from the reptile family and many more. The most interesting and impressive is the Japanese crane dance. A pair of cranes celebrate marriage by various actions. The male makes different sounds with his head raised and his wings outstretched, while the female, on the other hand, has her wings folded and responds to the mate with the same voice. Interdependence is also manifested by leaps, fluttering of wings, throwing grass in the air with beaks, and various snarls, and they do this with amazing grace. The thing is, her dances are sometimes in no way related to the wedding period as is customary at times. So, why does he behave like that? Can he even experience happiness? Ornithologists claim that writing sometimes causes positive emotions for no reason, and the most amazing thing is that it conveys this through "dance."[12]

In conclusion, synthesis with the artistic fields of choreography is a phenomenon in itself, but the psycho-physiological and socio-cultural nature of dance required the creation of a specific classifier of sciences to show that choreology as a non-scientific science. This, in turn, requires interdisciplinary research that sheds light on many interesting scientific innovations hidden behind the curtain of stage space.

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7 The field of kinetics-dynamics, which studies the driving forces of the body. Derived from the Greek word and read as "Kinesis" and means movement). Kinetography is a common name for graphic recording of human movements.

8 Конаев с. „запись тела и тело записи". журнал „TEATP „N 20, 2015г http://oteatre.info/zapis-tela-i-telo-zapisi/

9 *Лисициан С.* Запись движения (кинетография). — Искусство, 1940

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