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Arts

AESTHETIC AND EXPRESSIVENESS IN SPORT BALLROOM DANCE: THE SYNTHESIS OF SPORT AND ART

Amre Nursaulet

Kazakh national academy of choreography
Astana (Kazakhstan)

ЭСТЕТИКА И ВЫРАЗИТЕЛЬНОСТЬ В СПОРТИВНОМ БАЛЬНОМ ТАНЦЕ: СИНТЕЗ СПОРТА И ИСКУССТВА

Амре Нурсаулет

Казахская национальная академия хореографии
Астана (Казахстан)

Abstract

In modern culture, sports and art occupy a central place among the spheres of human activity. They are often perceived as opposing sociocultural phenomena. However, in recent decades, the situation has shifted: the globalization of sports as a social phenomenon has necessitated a scientific analysis of its interactions with politics, economics, and international relations. This study focuses on the relationship between sports and art. The article aims not only to examine the problem of interaction between these two cultural phenomena but also to explore, through the analysis of sports ballroom dance, the existence of a unique set of visual and expressive tools that allow dance sport to be perceived as a form of art with aesthetic value and expressiveness.

To address this issue, the dialectical method was applied, enabling the consideration of dance sport as an evolving and internally contradictory phenomenon. A diachronic approach was used to analyze the historical development of sports ballroom dance. Methods of analysis, synthesis, comparison, and generalization were employed to identify the common and specific features of dance sport and art.

The findings suggest that sports ballroom dance may be closer to art than other technical and aesthetic sports. While aesthetic expressiveness is inherent in all sports, it manifests and functions differently across disciplines. The authors argue that the synthesis of sports and art in dance sport has already been achieved. The future development of this discipline will likely be driven not by increasing human physical capabilities or technical mastery but by expanding the expressive potential of the human body, which has no limits.

Аннотация

В современной культуре спорт и искусство занимают ключевые позиции среди сфер человеческой деятельности. Часто они воспринимаются как противоположные социокультурные феномены. Однако в последние десятилетия ситуация изменилась: глобализация спорта как социального явления потребовала научного анализа его взаимодействий с политикой, экономикой и международными отношениями. В данном исследовании особое внимание уделяется отношениям между спортом и искусством. Цель статьи — не просто изучить проблему взаимодействия этих двух культурных феноменов, но и, основываясь на анализе спортивного бального танца, выявить существование уникального набора изобразительно-выразительных средств, который позволяет воспринимать танцевальный спорт как форму искусства с эстетической ценностью и выразительностью.

Для изучения данной проблемы использован диалектический метод, благодаря которому танцевальный спорт рассматривается как развивающееся и внутренне противоречивое явление. Исторический анализ формирования и эволюции спортивного бального танца выполнен с использованием диахронического подхода. Методы анализа, синтеза, сравнения и обобщения помогли выделить общие и специфические черты танцевального спорта и искусства.

Выводы исследования показывают, что спортивный бальный танец, возможно, ближе к искусству, чем другие технико-эстетические виды спорта. Хотя эстетическая выразительность присуща всем видам спорта, она проявляется и функционирует по-разному. Авторы уверены, что синтез спорта и искусства в танцевальном спорте уже состоялся. Дальнейшее развитие этой дисциплины, скорее всего, будет связано не с ростом физических возможностей человека или технического мастерства, а с расширением выразительных возможностей человеческого тела, которые не имеют ограничений.

Keywords: sports, physical culture, dance sport, sports ballroom dance, movement, plasticity, rhythm, improvisation.

Sports ballroom dancing, or dance sports, is a competition between sports pairs in Latin American, European programs and in the all-around. The recognition of ballroom dancing as a sport - "dance sport" - was preceded by serious, painstaking work. Therefore, the inclusion of the International DanceSport Federation in the International Olympic Committee in 1997 was a great victory for the International DanceSport Federation itself, national federations, and dancers around the world. Nevertheless, it seems that the "transition" of ballroom dancing from the sphere of art to the sphere of sports has generated many problems. This is the problem of preserving ballroom choreography, which has developed and improved over the centuries within the framework of art. The problem that exists in technical and aesthetic sports in general, namely, the strengthening of the technical component sometimes to the detriment of the aesthetic, the emphasis on form, and not on content. The problem associated with a high degree of subjectivity in assessing the performance skills of athletes. As you know, in the "Rules of the sport "Dance Sport"[9], the criteria for assessing the disciplines of the European and Latin American programs are indicated. The criteria include four components: performance technique, musicality of movement, partnership, choreography and presentation. And if there is a certain clarity with the evaluation of such subcomponents of the performance technique as posture, balance, the work of the feet and foot positions, the correct performance of specific actions described in the technique of each dance, and so on, then some difficulties arise with the evaluation of the criterion of "artistry". Artistry is understood as "an artistic figurative embodiment of a pair of characteristic features of the musical text and choreographic score" [9]. The assessment of artistry is based on the assessment of the "synchronicity, uniformity, continuity of all movements and the degree of technical perfection required by the organic integrity of the pair with each change in the nature of music, choreographic pattern and tempo of performance", on the assessment of the "dramatic, directorial content of choreography" [9]. The latter subcomponent seems to provide a great deal of scope for the subjective view, as it evaluates not so much the form as the content, not so much the movement as the attitude. No wonder dance is considered a plastic form of the soul, a means of expressing emotions, intimate thoughts and dreams, which cannot be measured only by quantitative characteristics and points. The works of Isadora Duncan, Anna Pavlova, Vaclav Nijinsky, modern dancers: Ricardo Kokka and Julia Zagoruichenko, Mirko Gozzoli and Edita Daniute, Marat Gimaev and Alina Basyuk, Dmitry Timokhin and Anna Bezikova confirm this idea. They are not only sports people, but also people of art. In modern culture, sports and art are one of the main spheres of human life. Both in the mass consciousness and in the scientific community, sports and art are often presented as mutually exclusive socio-cultural phenomena that do not have points of contact. In recent decades, the situation has changed: the transformation of sports into a global phenomenon has required a scientific study of the mutual influence of sports and politics, sports and economics, sports and international cooperation. Within the framework of this study, the question of the relationship between sports and art seems to be relevant. Sport, and even more so modern sport, which gathers millions of viewers at stadiums and TV screens, is a spectacle with great aesthetic expressiveness and great educational potential. To enhance the spectacular appeal of sports, sports that closely interact with art have been actively developing recently: rhythmic gymnastics, synchronized swimming, dance sports. The contact that arises between athletes and spectators during the performance-competition brings them mutual aesthetic pleasure. Despite the fact that today there are many works that raise the problem of the relationship between sports and art, there is no single point of view on this issue.

The American scientist B. Lowe in his book "The Beauty of Sports" gives a positive answer to the question: "Are a baseball player, sprinter, football player or boxer artists the same as a violinist, ballet

dancer, conductor?" and notes: "As a painter of paint and canvas, so the athlete for the demonstration of art is his own body. And his art can exist both for the sake of the process itself exclusively (the process of self-expression) and for the sake of the result (including public recognition and material reward). And this means that it is no different from the artistic activities of any other artist. Of course, the final results (works of art) differ - painting and sculpture remain for descendants, and the dance lives only as long as it is performed, and there is a place for sports in this spectrum of "differences". More precisely, it should be located in this spectrum closer to the dance" [8, p. 92-93]. Similar thoughts were expressed in his book "Aesthetics of Physical Culture" by A. A. Frenkin, who attributed rhythmic gymnastics and figure skating to art [14]. Famous domestic scientists: V. I. Stolyarov, M. Ya. Saraf, V. I. Samusenkova, recognizing the presence of certain common elements in sports and art, still consider them as cultural phenomena that differ from each other [11; 13]. Especially a lot of questions arise when it comes to dance sports, sports ballroom dancing. In this article, an attempt is made not just to consider the problem of the interaction of two cultural phenomena: sports and art, but through the analysis of sports ballroom dance to raise the question of the existence of a certain "set" of visual expressive means that allow us to consider dance sports not only as a sport, but also as a work of art with a certain aesthetic value and expressiveness. To solve this problem, a dialectical method was used, which made it possible to consider dance sport as a developing, internally contradictory, ambivalent phenomenon (in the "old" name of dance sport, sports ballroom dancing already reflects the existing duality inherent in this sport). The history of the formation and development of sports ballroom dance is considered through the use of the diachronic method. The selection of the general and special in dance sports and art is carried out through the methods of analysis and synthesis, comparison and generalization. Dance is considered one of the most ancient and popular cultural phenomena. Drawings of ancient people, which depict cult actions, confirm that already in the Paleolithic era, dance magical rites and rituals were performed, allegedly contributing to the connection of man with the forces of nature, space and the underworld [10, p. 2, 42, 43]. The question of the origin of the dance is still open. The naturalist C. Darwin believed that dance has a physiological nature and was born from the need of a person to broadcast his emotions. Religious roots were also attributed to the dance. According to the most common point of view, dance originated as a specific non-verbal communication system that appeared before speech and contributed to its occurrence. With the help of gestures, facial expressions, postures and rhythmic movements, ancient people conveyed information and developed peculiar life strategies. Dance is mentioned in all ancient legends and myths [10, p. 7, 43]. Pythagoras, Plato, Aristotle studied the musical arts: dance, music and poetry from aesthetic, pedagogical, philosophical and medical points of view. Speaking about the evolution of dance art, i.a. Gerasimova notes that in ancient Greece, dancing helped to develop rhythmic coordination of movements and dexterity in teaching martial art [6, p. 90]. In ancient Egypt, dance mainly performed religious ritual functions. Thousands of temple dancers and professional mourners, depicting suffering, sorrow and crying, participated in the grandiose funerals of the pharaohs. In Egyptian temples, "astrological narrative dances" were repeatedly held, in which brightly dressed priests depicting the signs of the zodiac participated. They circled around the altar representing the sun. Their movements resembled the movements of the sky and planets, and the stops symbolized the immobility of the Earth [10, c. 21]. The special importance of dance was preserved in later folk art. Round dances, quadrilles, competitive and game dances basically had ancient dance creativity.

Popular culture was often an opposition to the ruling aristocracy, expressing unacceptable thoughts and feelings through plasticity and rhythm. In Russia, this was manifested in the art of buffoons, in Latin America and Europe - in carnival performances [6, p. 97]. In the life of the aristocracy, dance was an essential part of etiquette. The symbolism of the gesture, color and geometric shape demonstrated the level of nobility and wealth of the genus [6, c. 97-98]. Ballroom dance originated in the 15th century in medieval Europe. Among the secular nobility of that time, it became fashionable to hold balls at which modified household folk dances were performed. Gradually, ballroom dancing has undergone changes and become popular in almost all European countries, including Russia, since the time of Peter the Great [2, p. 323]. At the beginning of the twentieth century, in the process of standardizing the ideas and techniques of performing the European dances known at that time (slow waltz, tango, Viennese waltz, slow foxtrot, quickstep), the so-called English dance style was formed. Competitions began to be held, since 1921 the Blackpool Dance Festival has become one of the most legendary tournaments [5, p. 25]. Acquaintance in the middle of the last century with bright and hot African and South American folk dances contributed to the emergence of the Latin American dance program: samba, cha-cha-cha, rumba, pasodoble, jive. At the same time, international organizations of amateurs and professionals are being created, currently known as the International Dance Committee and the International Dance Sports

Federation. In the Soviet Union, ballroom dancing took root for a long time and was difficult: there was a tendency not to accept everything Western, including ballroom dancing. However, in 1957, within the framework of the World Festival of Youth and Students, the first International Sports Dance Tournament was held in Moscow with demonstration performances by European champions Harry and Doreen Smith-Hampshire. Since then, ballroom dance has become actively distributed in circles, studios, houses of culture as a kind of amateur art activity [12, p. 4]. The competitive direction of ballroom dance gradually developed: all-Union competitions, seminars with famous European teachers were held, leading Soviet couples demonstrated high results at international competitions. At the All-Union competitions, not only the international program familiar to the whole world was performed, but also the historical program ("Mazurka Shaped", "Polka", "Pa-zefir") and the Soviet program, including stylized folk dances ("Russian Lyrical", "Sudarushka", "Rillio", "Varu-varu") [1, p. 138]. 1988 was marked by the creation of the Association of Ballroom Dance of the USSR, currently known as the All-Russian Federation of Dance Sports and Acrobatic Rock and Roll. This allowed the USSR to join the world federation and not only take part in international competitions, but also hold them in our country [2, p. 324]. In the 1990s, the International Dance Sports Federation was admitted to the General Association of International Federations and the International Association of World Games. Ballroom dancing was divided into sports (competitive) and social (amateur) areas. The interpretation of dance as a sport has opened up new opportunities for its development. The International Olympic Committee recognized sport dancing as a sport and included the International Dance Sports Federation in the IOC, but the lack of an objective system for assessing athletes does not make it possible to include dance sports in the Olympic Games even now. Why can dance be considered a sport? In our opinion, the dance requires the same qualities from the performer as from any other athlete. This is, first of all, physical strength, endurance. Dance sports competitions are held in several rounds. In each round, athletes must perform five two-minute dances. The finalists of major championships perform up to thirty dances during the tournament, the load of dancing athletes is comparable to the load of swimmers, runners, cyclists. Secondly, for maneuvering on the parquet floor and performing figures and lines, dancers, as well as gymnasts, basketball players, football players, need flexibility and coordination of movements. And finally, to win in dance sports, as in any other sport, you need to be organized and collected. On the other hand, dance sport, perhaps more than any other technical and aesthetic sport, is close to art. It is possible to argue about whether or not an artistic image characteristic of any kind of art is created in the process of performing dance, indisputably one dancer must have a unique, individual artistic style, which is a synthesis of the athlete's high technical skill and great aesthetic expressiveness.

The leading Russian philosopher and culturologist M.S. Kagan wrote that the opposite of artistic and non-artistic forms of human activity does not exclude their interaction. At the point of their contact, "in the border areas there is a constant dialectical transition of art into non-art and non-art into art" [7, p.321]. Sports ballroom dance, due to its high entertainment, imagery, and ability to perform the function of a performance, can be referred to as a certain kind of art as a way of knowing and understanding the world and one's place in the world. In sports ballroom dancing, the effect of aesthetic empathy, the complicity of spectators who perceive the movements of athletes as full of meaning and beauty is strong. M. S. Kagan noted that "among the many phenomena that have a plastic-dynamic (spatio-temporal) structure, the moving body of a person is most closely connected with his spiritual life and is thus able to express it directly" [7, p. 359]. The means of expressing the "spiritual life", the aesthetic experience here is not the brush, word or sound, but the person's own body. R. E. Voronin in his study devoted to the analysis of philosophical, aesthetic and artistic aspects of dance art defined sports ballroom dance as "rhythmic movements of the body or parts of the body, which are performed in a certain technique to music in order to express emotions and serve as a means of conveying the individual character of the generally significant relationship between a man and a woman" [4, p. 24].

As a component that creates aesthetic expressiveness, R. E. Voronin also called plasticity, or "a musical-plastic image that embodies the combination of the dancer's spiritual potential and his bodily expressiveness, thus ensuring the formation of spiritual mastery" [4, p. 24]. This statement should be clarified and supplemented with the productive provisions expressed in the article by a.i. Burachenko, T.A. Grigoryants, O.V. Bibliyeva "Plasticity as an integral category of a complex of disciplines in stage movement". Speaking about the upbringing of a dramatic artist, the authors of the article consider plasticity as a category that has the status of "a meta-concept that fixes the level of ideal completeness of a work of art." From their point of view, plasticity "is not limited only to the technological level" [3, p. 106-107], being the result of "a special type of thinking represented in a specifically organized type of thought-realization, when, on the one hand, the world is perceived as a system of plastic images, on the

other hand, it manifests itself in the ability, through an artistically created (plastic) form, to transmit to the recipient (viewer) a harmoniously created idea of the world. For an actor, being plastic on a general level means the ability to use an arsenal of bodily expressive means to build a stage image (character). For those "advanced" performers who have developed plasticity, the characteristic is not only the sharpness of the gesture in the stage presentation of the character, but also the ability to embody the artistic continuum only by means of plasticity" [3, p. 109]. That is, it is plasticity, having integral properties, that creates the unity of form and content in the process of dance. In our opinion, choreography, costume, improvisation should be added to the components that create the aesthetic expressiveness of sports dance. Choreography in dance sports refers to the combination of dance elements and figures in a competitive composition. Duets that have unique, saturated with "signature" movements, tricks and "chips" of the composition, which are competently located on the dance floor and holistically performed throughout the dance, have the opportunity to most clearly demonstrate their individual style. Such athletes attract attention, stand out among others by the unity and harmony of the image and are remembered. At the same time, the correct construction of competitive compositions, including those elements that dancers will be able to do, is essential. The introduction of a new and preservation in the choreographies of the main figures, developed and improved by eminent athletes and coaches for years, is also a necessary attribute of a high-quality, aesthetically mature dance. The costume, selected not only in accordance with the requirements of dance sports, but also in accordance with the type of program and the emotional mood of the couple, has great aesthetic significance. M. S. Kagan noted that the moving human body is not the only means capable of expressing "spiritual life", because in dance "the artistic genius of mankind is not satisfied with the opportunities that are directly given to man (his "natural languages" - sound, verbal, pantomimic), and is looking for indirect ways of cognition and modeling of spiritual life, capable of indirectly embodying such aspects of the connection between subject and object, which are not suitable for expression by natural means inherent in man himself" [7, p. 359]. Such "indirect means" may be costume and makeup. And finally, improvisation, namely the ability to masterfully get out of unforeseen situations, creatively interpret the musical accompaniment, avoiding a collision on the floor, while achieving mutual understanding in a pair in unpredictable competition conditions. It seems that improvisation as the ability to convey emotional and aesthetic bodily expressiveness through free, harmonious, sincere movement is possible not so much in couples who have achieved only a high level of technical skill, as in those dancers-athletes who perceive their body as a conductor of feelings and emotions, and movement as a special way of thinking. Up to fifteen couples can dance on the floor at the same time, but only a few of them are desirable to look at, they attract attention, their performance is fascinating. But it is possible to attract the viewer's attention with a bright costume, but to keep this attention, to convey the deep philosophical character of the dance, to reveal its beauty, only couples who have an individual style, manifested in the interaction of high technical skill and great aesthetic expressiveness.

In conclusion, it should be noted that aesthetic expressiveness is inherent in all sports (for example, the 1982 World Cup champion, who was at one time the coach of the Italian national team, Enzo Bearzot wrote about his favorite sport as a theater whose performances should excite and delight people), but aesthetic expressiveness manifests and functions in different ways. As for competitive ballroom dancing, we are convinced that the synthesis of sports and art took place here. The development of dance sports is possible not only by increasing the physical capabilities of a person and increasing the level of technical skill (which is already quite high, especially among Russian dance couples), but by increasing the emotional and aesthetic expressive capabilities of human physicality, where there is no limit.

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ARTISTIC INTERPRETATION OF CORPORALITY AND PARTNERSHIP IN COMPETITIVE BALLROOM DANCING: AN ART STUDIES ANALYSIS

Amre Nursaulet

Kazakh National Academy of Choreography
(Astana, Republic of Kazakhstan)

ХУДОЖЕСТВЕННАЯ ИНТЕРПРЕТАЦИЯ ТЕЛЕСНОСТИ И ПАРТНЕРСТВА В СПОРТИВНЫХ БАЛЬНЫХ ТАНЦАХ: ИСКУССТВОВЕДЧЕСКИЙ АНАЛИЗ

Амре Нурсаулет

Казахская национальная академия хореографии
(Астана, Республика Казахстан)

Abstract

Competitive ballroom dancing is not merely a sequence of movements but a medium for the artistic interpretation of partner relationships through physical expressiveness. This article examines the phenomenon of corporality in dance, its connection to partnership, and the means by which dance becomes an instrument for conveying emotional content. The philosophical aspects of body perception, interaction with space, and the role of the dance duo as a metaphor for social and cultural relationships are also discussed.

Аннотация

Спортивные бальные танцы не просто совокупность движений, но и средство художественной интерпретации отношений между партнерами через физическую выразительность. В данной статье исследуется феномен телесности в танце, его связь с партнерством, а также анализируются средства, с помощью которых танец становится инструментом передачи эмоционального содержания. Обсуждаются философские аспекты восприятия тела, взаимодействие с пространством и роль танцевального дуэта как метафоры социальных и культурных отношений.

Keywords: partnership, movement aesthetics, corporality, symbolism, cultural codes, social interactions

Ключевые слова: партнерство, эстетика движения, телесность, символика, культурные коды, социальные взаимодействия

Проблематика исследования. Искусствоведение, изучающее танец, традиционно сосредотачивается на элементах эстетики, ритма и движения. Однако мало внимания уделяется телесности и партнерству как ключевым средствам художественного выражения. В спортивных бальных танцах партнерство выходит за рамки взаимодействия тел: оно становится языком, способным передавать культурные, эмоциональные и даже философские идеи.

Цель исследования. Целью данной работы является изучение телесности и партнерства в спортивных бальных танцах как художественного феномена.

Задачи:

1. Проанализировать телесность как средство художественной выразительности
2. Исследовать философский аспект партнерства в танцевальном контексте.
3. Рассмотреть символическую интерпретацию танца как метафоры человеческих отношений.

Основная часть. В танце тело становится инструментом, через который человек выражает не только физическую, но и эмоциональную природу. Спортивные бальные танцы предполагают техническое совершенство тела, что, в свою очередь, поднимает вопрос: как достигается баланс между строгостью техники и свободой художественного самовыражения? Телесность в танце можно определить как комплексное взаимодействие тела, движения и пространства, которое создает визуальную и эмоциональную форму художественного произведения. В спортивных бальных танцах тело становится основным медиумом, через

который передаются эмоции, ритм, характер и смысл каждого танца. В отличие от других видов танцевального искусства, таких как балет или современный танец, где акцент может быть сделан на индивидуальную выразительность, в бальных танцах телесность включает в себя еще и партнерское взаимодействие, что делает этот феномен особенно сложным и многогранным. Техническая подготовка танцоров играет ключевую роль в формировании телесности. Каждое движение, будь то плавный шаг в медленном вальсе или резкий акцент в танго, должно быть идеально выверено с точки зрения биомеханики. Однако техника не ограничивается только функциональностью: она служит основой для создания эстетики. Например, контраст между плавностью и резкостью движений в румбе символизирует напряжение и страсть, в то время как равномерные линии в фокстроте передают чувство гармонии и утонченности. Телесность в спортивных бальных танцах не ограничивается физическим исполнением движений. Она является также средством эмоциональной коммуникации. Эмоциональная пластика, включающая мимику, жесты и осанку, позволяет танцорам выразить сложные чувства — от радости и любви до напряжения и даже драматического конфликта. Это особенно заметно в таких танцах, как танго, где партнёры передают драму человеческих взаимоотношений через ритм и характер движений. Мимика и жесты являются продолжением физического движения, добавляя выразительности и подчеркивая эмоциональное содержание танца. Например, в пасодобле мимика партнера-мужчины отражает достоинство и решимость, в то время как жесты его партнерши передают грацию и силу. Таким образом, танец становится не просто физическим действием, но и формой повествования. Одной из уникальных черт спортивных бальных танцев является партнерство, которое играет важную роль в формировании телесности. Тела партнеров вступают в своеобразный диалог, где каждый из них не только следит за своим движением, но и адаптируется к движениям другого. Это взаимодействие требует высокого уровня координации, доверия и эмоциональной связи между партнерами. Партнерство в бальных танцах можно рассматривать как символическое отражение социальных отношений. Танцевальный дуэт демонстрирует баланс между лидерством и подчинением, что проявляется в роли партнера, ведущего танец, и партнера, следующего за движением. Важным аспектом телесности является динамическое взаимодействие с пространством. Танцоры не просто занимают сценическое пространство; они создают его посредством движения. Пространство "вокруг тела" становится частью художественного языка, подчеркивая значимость каждого жеста и шага. Танцевальные роли партнеров также отражают гендерные и культурные стереотипы, которые могут варьироваться в зависимости от контекста. Например, традиционное распределение ролей, где мужчина выступает лидером, а женщина следует, символизирует определенные социальные иерархии. Однако в современных интерпретациях эти роли могут пересматриваться, открывая новые возможности для художественного самовыражения. Каждый танец в спортивных бальных танцах несет в себе элементы национальной культуры. Например, самба, происходящая из Бразилии, передает атмосферу карнавала и свободы, в то время как пасодобль, вдохновленный испанской корридой, символизирует борьбу и торжество. Эти культурные коды выражаются через телесность, превращая движения танцоров в метафоры культурных ценностей и традиций. Танец, как форма искусства, всегда был символическим актом, передающим социальные, религиозные или философские идеи. Телесность в спортивных бальных танцах становится медиумом для этой символики. Например, в танго партнеры могут символизировать драму человеческих отношений, где каждый шаг отражает баланс между страстью и конфликтом. С развитием международных соревнований телесность в спортивных бальных танцах становится объектом стандартизации. Международные организации, такие как World Dance Sport Federation (WDSF), устанавливают строгие критерии оценки, которые включают технику, ритмичность и артистизм. Однако этот процесс может ограничивать индивидуальность и уникальность телесного выражения. Современные танцоры и хореографы ищут новые пути интерпретации телесности, экспериментируя с движениями и элементами других танцевальных стилей. Это позволяет расширить границы спортивных бальных танцев, делая их более универсальными и привлекательными для широкой аудитории. Телесность в спортивных бальных танцах является сложным и многогранным феноменом, объединяющим биомеханику, эмоциональную выразительность и культурное значение. Через взаимодействие с пространством, партнером и зрителем телесность становится основным инструментом художественного выражения. Танец, таким образом, превращается в форму искусства, где

каждое движение несет в себе глубинный смысл и эмоциональную насыщенность. Искусствоведческий анализ телесности в спортивных бальных танцах открывает новые перспективы для понимания этого феномена, подчеркивая его значение как в культурном, так и в художественном контексте. Дальнейшие исследования в этой области могут способствовать более глубокому пониманию танца как формы межкультурного диалога и средства художественного самовыражения.

Техника движений — вращения, поддержки, шаги — в бальных танцах подчинена эстетическим законам, которые стремятся к созданию визуальной гармонии. Плавность вальса или резкость пасодобля становится не только техническим элементом, но и средством передачи настроения. История спортивных бальных танцев уходит корнями в европейские бальные традиции XVIII–XIX веков, где танцы были важной частью придворных церемоний и общественных собраний. Эстетика движения в этих танцах была подчинена культурным нормам того времени: подчеркнутая грация, изящные линии и точная координация. Танцы, такие как вальс, мазурка и полька, развивались в строгих рамках этикета, где движения выражали статус, манеры и вкус. В XX веке, с институционализацией спортивных бальных танцев, их эстетические каноны трансформировались под влиянием международных стандартов. Создание организаций, таких как World Dance Sport Federation (WDSF), способствовало формированию унифицированных критериев оценки, включающих как технические аспекты, так и художественную выразительность. Со временем эстетика спортивных бальных танцев приобрела более универсальный характер, вобрав в себя элементы разных культур. Например, латиноамериканские танцы, такие как самба и румба, добавили в танцевальный арсенал спортивных пар энергичность и драматизм, тогда как европейские танцы, такие как фокстрот и квикстеп, сохранили утонченность и ритмическую строгость. Эстетика движения в бальных танцах во многом определяется техническим мастерством танцоров. Каждое движение подчинено принципам биомеханики, которые обеспечивают плавность, точность и экономичность движений. Например, в вальсе характерным является плавное «качание» (swing), достигаемое благодаря правильному распределению веса и контролю над движением ног и корпуса. Это создает иллюзию «скольжения» по танцполу, что является важным эстетическим критерием. Важным элементом эстетики является использование баланса и центровки. Танцоры должны поддерживать равновесие не только индивидуально, но и в паре, что усиливает визуальную гармонию. Например, вращения в танго или сложные поддержки в латиноамериканских танцах требуют идеального взаимодействия партнеров. Гармония движений — центральный аспект эстетики бальных танцев. Она достигается благодаря синхронности партнеров, плавности переходов и ритмической согласованности с музыкой. Ритм в бальных танцах играет роль структурного каркаса, на котором строится композиция. Например, в самбе акцент на вторую долю такта подчеркивает энергичность танца, а в медленном фокстроте ритмическая последовательность «длинный-короткий-длинный» создает ощущение спокойной элегантности. Эстетика движения также определяется визуальными линиями и формами, создаваемыми телами танцоров. Это включает положение рук, осанку, углы наклона корпуса и динамику ног. В стандартных танцах линии должны быть максимально вытянутыми и симметричными, что создает эффект утонченности. В латиноамериканских танцах, напротив, акцент делается на экспрессивных формах, где линии могут быть более динамичными и асимметричными. Партнерство в спортивных бальных танцах — это ключевой элемент, который формирует эстетику движения. Взаимодействие между партнерами можно рассматривать как своеобразный «диалог», где лидерство одного партнера (чаще всего мужчины) дополняется откликом другого (женщины). Это создает гармоничную композицию, в которой оба партнера участвуют на равных, несмотря на разные роли. Физический контакт между партнерами — еще один важный аспект эстетики. В стандартных танцах, таких как вальс или квикстеп, партнеры находятся в постоянном телесном контакте, что требует идеального соответствия позиций корпуса и рук. В латиноамериканских танцах контакт может быть более свободным, что позволяет танцорам выражать эмоции через индивидуальные движения. Эстетика движения в спортивных бальных танцах представляет собой сложный и многосоставной феномен, включающий техническую точность, эмоциональную выразительность, партнерство и культурное наследие. Каждое движение в танце — это результат взаимодействия биомеханики, ритма, формы и символизма, что превращает спортивные бальные танцы в настоящее искусство. Дальнейшее исследование эстетики движения позволит углубить

понимание роли бальных танцев в культурном контексте, а также раскрыть их значение как формы универсального художественного языка.

Партнеры используют жесты, положение тела и мимику для передачи эмоций, что делает танец почти театральным. Эти аспекты телесности ставят танцы на один уровень с такими видами искусства, как балет или современный театр. Эмоциональная пластика в спортивных бальных танцах представляет собой сложный феномен, который интегрирует физическую выразительность, художественное содержание и культурные коды. Она является неотъемлемым аспектом танцевального искусства, где каждое движение тела танцоров становится выразителем чувств, настроений и драматургического замысла. Этот аспект танца выходит за рамки техники и биомеханики, становясь ключевым элементом художественного воздействия на зрителя и эстетической оценки. Эмоциональная пластика, как часть танцевального искусства, может быть определена как совокупность движений и поз, которые выражают определенные эмоциональные состояния через физическое взаимодействие партнеров. В спортивных бальных танцах, которые включают как европейскую, так и латиноамериканскую программы, пластика движений является средством передачи содержания танца, связанного с его культурными истоками и музыкальными особенностями. Например, в танго эмоциональная пластика передает напряжение и страсть, вальс же выражает романтику и плавность. Фундаментальная основа эмоциональной пластики в спортивных бальных танцах закладывается через работу над техническими аспектами танца. Контроль над телом, включая осанку, распределение веса, амплитуду движений и их плавность, является ключевым для достижения выразительности. Однако пластика движений не сводится только к технической правильности. Она включает в себя динамику, взаимодействие партнеров и способность танцоров интегрировать свои эмоции в каждый жест. Это достигается через глубокое понимание музыкального сопровождения, которое служит основным источником ритмической и эмоциональной структуры танца. Музыка играет центральную роль в формировании эмоциональной пластики. В спортивных бальных танцах мелодия и ритм диктуют характер движений, их интенсивность и амплитуду. Например, самба требует от танцоров энергичных и жизнерадостных движений, которые передают дух карнавала. В румбе, напротив, акцент делается на плавность и чувственность, что создает атмосферу интимности и страсти. Таким образом, пластика движений становится прямым отражением музыкального содержания, что позволяет зрителю воспринимать танец как единое художественное произведение. Одним из ключевых аспектов эмоциональной пластики является партнерское взаимодействие, которое выступает не только как технический элемент, но и как средство художественной коммуникации. Взаимодействие между партнерами строится на диалоге их тел, где каждый жест и движение одного партнера находят отклик в действиях другого. Это взаимодействие особенно очевидно в танго, где характерные резкие паузы и изменения динамики создают напряжение и драматизм. В стандартных танцах, таких как вальс, партнеры поддерживают плавность и синхронность движений, что подчеркивает гармонию их взаимодействия. Эмоциональная пластика в спортивных бальных танцах тесно связана с культурными кодами и символикой каждого танца. Например, пасодобль символизирует испанскую кориду, что отражается в позах и жестах, напоминающих матадора и его плащ. Это требует от танцоров не только технической подготовки, но и глубокого понимания культурного контекста, чтобы передать характер и настроение танца. Аналогично, самба несет в себе элементы бразильской культуры, выражая радость и жизнеутверждающий характер через энергичные движения бедер и ног. Важным аспектом эмоциональной пластики является использование мимики и жестов, которые дополняют движения тела, усиливая выразительность. Мимика играет ключевую роль в создании эмоциональной связи с аудиторией, позволяя танцорам передавать тонкие нюансы чувств. В румбе, например, взгляд и выражение лица партнеров подчеркивают интимность их взаимодействия, тогда как в квикстепе улыбки и легкость мимики создают атмосферу игривости и веселья. Жесты, в свою очередь, используются для акцентирования определенных движений или музыкальных акцентов, что усиливает драматизм или подчеркивает характер танца. Эмоциональная пластика в спортивных бальных танцах оценивается как неотъемлемая часть артистизма на соревнованиях. Международные стандарты в выдвигаемые World Dance Sport Federation (WDSF), включают критерии, которые требуют от танцоров не только технического мастерства, но и способности передать характер и содержание танца через

движения. Артистизм и эмоциональная выразительность становятся решающими факторами в случаях, когда технические оценки танцоров находятся на одинаковом уровне.

Существует также философский аспект эмоциональной пластики, связанный с идеей танца как формы невербальной коммуникации. Через движения и взаимодействие партнеры создают художественный образ, который может быть интерпретирован зрителем на разных уровнях. Например, в танго партнеры могут выражать сложные эмоции, такие как страсть, ревность или борьба, что делает этот танец драматическим и символически насыщенным. В стандартных танцах, таких как медленный вальс, пластика движений передает чувство покоя и гармонии, создавая визуальное воплощение романтической мелодии. Эмоциональная пластика также зависит от индивидуальных особенностей танцоров, их харизмы и способности интегрировать личные эмоции в исполнение. Опытные танцоры часто используют свои индивидуальные качества для создания уникальных интерпретаций танца, что позволяет им выделяться на фоне других участников. Это подчеркивает важность не только техники, но и личностного вклада в исполнение танца, который становится не только спортивным достижением, но и художественным актом. В контексте глобализации и стандартизации спортивных бальных танцев эмоциональная пластика сталкивается с вызовами. С одной стороны, унификация правил способствует созданию единого языка танца, который понятен зрителям по всему миру. С другой стороны, это может ограничивать индивидуальность и культурные особенности, которые являются важными элементами эмоциональной пластики. Например, стандарты могут требовать определенной формы движений, что уменьшает возможности для свободной интерпретации и самовыражения. Современные тенденции в спортивных бальных танцах, включая использование элементов из других танцевальных стилей, таких как контемпорари или джаз, открывают новые возможности для развития эмоциональной пластики. Это позволяет танцорам экспериментировать с движениями, выходящими за рамки традиционных канонов, и создавать более сложные и эмоционально насыщенные композиции. Технологии, включая видеозаписи и социальные сети, также способствуют распространению новых идей и стилей, что расширяет границы танцевального искусства. Эмоциональная пластика в спортивных бальных танцах представляет собой многогранный феномен, который объединяет технику, артистизм и культурное содержание. Она является ключевым элементом, который делает танец не только физическим упражнением, но и формой искусства, способной передавать сложные эмоции и символические значения. Исследование этого аспекта танцевального искусства позволяет глубже понять, как взаимодействуют техника и эмоциональное содержание, создавая уникальные художественные образы.

Символика партнерства. Партнерство в бальных танцах — это больше, чем просто физическое взаимодействие. Оно символизирует взаимодействие двух начал: мужского и женского, активного и пассивного, гармонии и конфликта. Например, в танго партнеры не только движутся в унисон, но и “ведут диалог”, который может быть прочитан как символ любовных или социальных отношений. Партнерство в спортивных бальных танцах представляет собой уникальный феномен, который выходит за рамки простого взаимодействия двух танцоров. Это явление одновременно техническое, художественное и философское, где каждый элемент танца становится носителем определенного смысла. Партнерство, как философская категория, отражает не только телесное взаимодействие, но и символику человеческих отношений, культурные коды и социальные нормы. В спортивных бальных танцах партнерство формирует основу движения, эмоциональной выразительности и сценической композиции, что делает его важным объектом искусствоведческого анализа. Партнерство в танце можно рассматривать как метафору взаимодействия двух начал: активного и пассивного, мужского и женского, равенства и соперничества. Эта дихотомия лежит в основе большинства танцевальных композиций, где роль каждого партнера строго определена, но в то же время предоставляет пространство для художественной интерпретации. Например, традиционно партнер-мужчина выступает как “ведущий”, задающий направление и характер движения, тогда как партнерша-женщина “следует”, добавляя танцу грации и эмоциональной насыщенности. Это распределение ролей символизирует баланс между структурой и свободой, где каждый партнер дополняет другого, создавая гармоничное целое. Символика партнерства в спортивных бальных танцах выражается через физическое взаимодействие, которое включает поддержки, вращения, позиционирование и синхронность движений. Поддержки, например, символизируют доверие и

взаимозависимость, что особенно заметно в стандартных танцах, таких как вальс или фокстрот. Здесь телесное взаимодействие двух танцоров становится визуальным воплощением гармонии, основанной на равновесии и взаимной поддержке. В латиноамериканских танцах, таких как румба или пасодобль, взаимодействие приобретает драматический и эмоциональный характер. В пасодобле, к примеру, партнер и партнерша олицетворяют матадора и его плащ, что символизирует борьбу, власть и подчинение. Философия партнерства в танце также включает элементы лидерства и подчинения, которые могут быть интерпретированы как отражение социальных и гендерных ролей. В большинстве традиционных танцевальных форм партнер-мужчина выступает как лидер, что соответствует историческим и культурным нормам, доминировавшим в обществе на момент их создания. Однако в современном контексте эти роли нередко пересматриваются, позволяя женщинам принимать более активное участие в формировании движения. Это подчеркивает гибкость танцевального искусства как средства художественного выражения и его способность адаптироваться к изменяющимся социальным условиям. Важным аспектом партнерства является символика дистанции и близости между танцорами. В зависимости от характера танца, расстояние между партнерами может варьироваться от тесного физического контакта до полного разделения. Например, в танго физическая близость партнеров подчеркивает напряжение и страсть, создавая эффект драматического взаимодействия. В квикстепе же акцент делается на скорость и легкость, что требует большей физической свободы и независимости движений. Это позволяет рассматривать дистанцию как символическую репрезентацию эмоциональных или социальных отношений, выражаемых через движение. Партнерство также тесно связано с музыкальным сопровождением, которое определяет характер взаимодействия. Музыка служит структурным каркасом, на котором строится композиция, задавая ритм, динамику и настроение танца. Партнеры должны не только следовать музыкальному рисунку, но и интерпретировать его через свои движения, создавая гармоничное слияние звука и пластики. Например, в румбе акценты музыки подчеркивают напряжение и релаксацию, что находит отражение в смене динамики движений партнеров. Эмоциональная составляющая партнерства в спортивных бальных танцах не менее значима. Каждый танец — это своего рода рассказ, в котором партнеры играют главные роли. Этот нарратив передается через жесты, мимику, осанку и взаимодействие взглядов. Например, в танго партнеры часто избегают прямого зрительного контакта, что создает эффект скрытого конфликта или напряжения. В вальсе, напротив, зрительный контакт усиливает чувство близости и романтики. Эмоциональная пластика партнерства становится важным инструментом, позволяющим зрителю не только воспринимать танец как зрелище, но и эмоционально вовлекаться в его содержание.

Технические аспекты партнерства также играют ключевую роль в формировании символика танца. Точные движения, синхронность и координация являются не только показателями профессионализма танцоров, но и важными элементами художественной выразительности. Вращения, поддержки и линии создают визуальные образы, которые могут быть интерпретированы как символические репрезентации различных эмоциональных или философских концепций. Например, круговые движения партнеров в вальсе могут быть прочитаны как символ бесконечности или цикличности времени, тогда как резкие паузы в танго передают момент принятия решения или конфликта. Философский аспект партнерства проявляется и в его способности отражать более широкие социальные и культурные контексты. Взаимодействие партнеров на танцполе может быть интерпретировано как метафора человеческих отношений, где каждый шаг символизирует определенный аспект взаимодействия — сотрудничество, соперничество, доверие или независимость. Например, в пасодобле борьба между партнерами становится метафорой борьбы за власть, а в самбе их взаимодействие отражает радость и энергетику коллективного праздника. Это делает партнерство универсальным языком, способным передавать сложные культурные и философские идеи через танцевальные движения. Современные тенденции в спортивных бальных танцах также вносят изменения в понимание партнерства. Введение элементов из других танцевальных стилей, таких как контемпорари или хип-хоп, позволяет экспериментировать с новыми формами взаимодействия. Это открывает возможности для переосмысления традиционных ролей партнеров, предоставляя больше свободы для самовыражения и творчества. Кроме того, использование технологий, таких как видеозаписи и

цифровая визуализация, позволяет анализировать и интерпретировать партнерство на более глубоком уровне, подчеркивая его художественную и философскую значимость. С одной стороны, унификация правил способствует созданию единого танцевального языка, который понятен зрителям по всему миру. С другой стороны, стандартизация может ограничивать индивидуальность и культурное разнообразие, которые являются важными элементами партнерства. Это приводит к необходимости сохранять баланс между технической строгостью и свободой художественного самовыражения, что является одной из ключевых задач современных танцоров и хореографов. Партнерство служит не только основой танцевального движения, но и средством передачи культурных, социальных и эмоциональных значений. Символика партнерства, выраженная через движения, жесты и взаимодействие, позволяет танцам выходить за рамки спортивного соревнования, превращая их в универсальный язык искусства и человеческих отношений. Анализ этого аспекта танцевального искусства открывает новые перспективы для понимания роли партнерства как художественного и философского явления.

Танец как метафора социальных взаимодействий. Танец, как форма искусства, изначально возникший в культурных и социальных контекстах, служит отражением человеческих взаимодействий, ценностей и иерархий. В спортивных бальных танцах этот аспект особенно значим, так как их природа предполагает партнерское взаимодействие, регламентированное правилами, но наполненное символикой и эмоциональной выразительностью. Танец становится не просто набором движений, но и метафорой социальных взаимодействий, где каждая поза, жест и ритмическая структура содержат отсылки к отношениям между людьми, к их стремлению к гармонии, лидерству, взаимопониманию и соперничеству. Партнерство в спортивных бальных танцах — это не только технический аспект, но и отражение социальных моделей взаимодействия, основанных на взаимной зависимости и координации. Танец предлагает уникальный способ исследования этих моделей, создавая пространственный и временной контекст, в котором партнеры должны синхронизироваться, демонстрируя одновременно индивидуальность и способность к сотрудничеству. Например, роль ведущего партнера и партнера, следующего за движением, символизирует гендерные и социальные роли, исторически закрепившиеся в культуре. Мужчина в традиционном танцевальном дуэте часто выступает как лидер, определяющий направление и темп, а женщина, следуя за ним, дополняет композицию пластикой и экспрессией. Однако это взаимодействие выходит за рамки строгого подчинения: оно представляет собой динамичный процесс взаимного влияния, который можно интерпретировать как метафору диалога в социальных отношениях. Взаимодействие партнеров в танце также иллюстрирует концепцию баланса между независимостью и зависимостью. Каждый танцор должен сохранять свою техническую и артистическую автономию, одновременно принимая во внимание движения другого. Это отражает принцип социальной взаимозависимости, согласно которому индивидуальные действия приобретают смысл только в контексте общего взаимодействия. Например, в танго, где движения часто характеризуются резкими остановками и изменениями направления, партнеры демонстрируют способность адаптироваться к действиям друг друга, создавая напряжение, которое символизирует сложные человеческие отношения, наполненные конфликтами и гармонией. Танец также репрезентирует социальные иерархии и механизмы власти. В некоторых танцах, таких как пасодобль, партнеры принимают символические роли, которые подчеркивают отношения доминирования и подчинения. Мужчина в этом танце часто ассоциируется с образом матадора, а женщина — с его плащом или быком. Такое распределение ролей указывает на иерархическую структуру взаимодействий, где один из партнеров занимает более активную, "лидирующую" позицию. Однако важно отметить, что эта иерархия не является статичной: в динамике танца роли могут меняться, что отражает идею гибкости социальных взаимодействий. Пространственное взаимодействие партнеров на танцполе также имеет символический характер. Близость и дистанция между партнерами передают различные аспекты социальных отношений. Например, тесный физический контакт в вальсе подчеркивает близость и доверие, создавая образ гармоничного союза. В румбе или самбе, где движения партнеров часто характеризуются большей свободой и независимостью, дистанция между ними символизирует индивидуальность и свободу в рамках совместного действия. Эти пространственные аспекты танца могут быть интерпретированы как метафоры личных границ, взаимного уважения и автономии, которые являются важными элементами социальных взаимодействий. Музыкальное сопровождение в спортивных бальных танцах усиливает

символику социальных взаимодействий, добавляя эмоциональную глубину и задавая ритмическую структуру, которая направляет движения партнеров. Музыка, как универсальный язык, позволяет танцорам выражать сложные эмоциональные состояния, такие как радость, печаль, страсть или напряжение. Например, в самбе акцент на ритмическом рисунке передает атмосферу праздника и коллективной энергии, что можно интерпретировать как символ коллективного взаимодействия. В то же время, драматичный ритм танго или пасодобля акцентирует внимание на индивидуальном конфликте, что позволяет глубже исследовать аспекты личных и социальных напряжений.

Социальные взаимодействия, репрезентируемые в танце, также связаны с культурными и историческими контекстами. Каждый танец несет в себе определенные культурные коды, которые влияют на интерпретацию партнерского взаимодействия. Например, вальс, возникший в европейской аристократии, отражает идеалы утонченности, гармонии и социального порядка. Латиноамериканские танцы, такие как румба или ча-ча-ча, демонстрируют экспрессивность, энергию и эмоциональную насыщенность, связанные с традициями коллективных праздников и карнавалов. Эти культурные аспекты подчеркивают, что танец не просто является метафорой индивидуальных взаимодействий, но и отражает более широкие социальные и культурные структуры. Эмоциональная составляющая танца играет важную роль в создании его социальной символики. Через движения, мимику и жесты танцоры передают эмоциональные состояния, которые могут быть интерпретированы как метафоры межличностных отношений. Например, в румбе пластичность и плавность движений партнеров выражают чувственность и близость, тогда как в квикстепе легкость и динамика подчеркивают игривость и радость. Эти эмоциональные аспекты позволяют зрителю не только наблюдать за танцем, но и сопереживать его содержанию, что создает эффект "эмоциональной проекции", при котором зритель интерпретирует движения танцоров через собственный опыт. Символика социальных взаимодействий в танце также включает элементы ритуала, которые укрепляют его роль как культурного феномена. Танец, как и многие формы искусства, берет свое начало в ритуальных практиках, связанных с общением, празднованием и выражением коллективных ценностей. В спортивных бальных танцах этот ритуальный элемент сохраняется в форме композиционной структуры, которая отражает цикличность жизни, повторяемость социальных сценариев и необходимость согласования индивидуальных действий с коллективными целями. Современные тенденции в спортивных бальных танцах открывают новые возможности для исследования танца как метафоры социальных взаимодействий. Использование новых хореографических приемов, заимствованных из других танцевальных стилей, позволяет экспериментировать с формами партнерского взаимодействия, делая их более разнообразными и сложными. Это расширяет границы традиционных интерпретаций танца, подчеркивая его способность адаптироваться к изменяющимся социальным условиям. Например, включение элементов контемпорари-танца в композиции спортивных бальных танцев позволяет создавать более абстрактные и многослойные образы, которые углубляют их социальное и философское содержание. Танец, таким образом, представляет собой уникальную форму искусства, которая объединяет физическую выразительность, эмоциональное содержание и социальную символику. В спортивных бальных танцах каждая деталь — от позиций партнеров до ритма музыки — становится инструментом для передачи смыслов, связанных с человеческими отношениями и их динамикой. Это делает танец мощным средством коммуникации, способным передавать сложные идеи и эмоции через движение. Анализ танца как метафоры социальных взаимодействий позволяет глубже понять его художественную и культурную значимость, подчеркивая его роль как универсального языка, способного объединять людей независимо от их культурных и социальных различий.

Заключение. Телесность и партнерство в спортивных бальных танцах — это сложные феномены, которые выходят за рамки спортивного соревнования. Анализируя их с точки зрения искусствоведения, можно увидеть, как танец становится художественным инструментом для передачи эмоций, культурных кодов и философских идей. Взаимодействие тел, эмоций и пространства в танце позволяет раскрыть его как глубокий художественный феномен, способный отражать социальные и культурные реалии. Танец как форма искусства и коммуникации представляет собой уникальное явление, способное синтезировать физическое мастерство, эмоциональную выразительность и философскую глубину. Анализ тем, связанных с партнерством, телесностью, эстетикой движения и символикой танца, показывает, что

спортивные бальные танцы являются не только спортивной дисциплиной, но и формой художественного самовыражения, которая отражает сложность человеческих взаимодействий и культурных контекстов. Партнерство в спортивных балльных танцах выступает как метафора социальных взаимодействий, где каждое движение, жест и поза имеют символическое значение. Диалог между партнерами, основанный на взаимной поддержке, лидерстве и следовании, отражает ключевые аспекты межличностных отношений. Взаимозависимость партнеров в танце не только подчеркивает гармонию, но и демонстрирует динамику сотрудничества, конкуренции и взаимного влияния. Например, распределение ролей, где партнер-мужчина традиционно выступает как лидер, а партнерша-женщина как вдохновляющая сила, символизирует баланс структур и свободы, что можно интерпретировать как универсальный принцип социальных систем. Однако современный танец, благодаря своей эволюции, предлагает возможность переосмысления этих ролей, открывая пространство для новых интерпретаций, где равенство и индивидуальность играют центральную роль. Эстетика движения в спортивных балльных танцах подчеркивает важность физической гармонии, ритмичности и пластичности. Каждое движение строится на основе биомеханической точности и эмоциональной пластики, что превращает танец в живую картину. Линии и формы, создаваемые телами танцоров, усиливают визуальное восприятие, добавляя к ним элементы драматургии и экспрессии. Например, вальс, с его плавными и непрерывными движениями, символизирует романтику и гармонию, тогда как драматичные паузы и острые линии танго передают напряжение и страсть. Эти эстетические характеристики позволяют танцам становиться не только визуально привлекательными, но и глубокими с точки зрения интерпретации человеческих эмоций. Телесность, как основа танцевального искусства, становится не только физическим инструментом, но и носителем художественного содержания. В спортивных балльных танцах тело выступает в роли медиума, передающего сложные эмоциональные состояния и культурные коды. Техника исполнения — будь то точность шагов, синхронность движений или плавность линий — закладывает фундамент для художественного самовыражения. Однако, кроме технического аспекта, телесность включает в себя элементы взаимодействия с пространством, музыкой и партнером. Например, пластика движений в румбе, с её акцентами на плавность и чувственность, создает атмосферу интимности, которая обращается к зрителю на эмоциональном уровне. В то же время энергичная динамика самбы передает радость и коллективное единство, что подчеркивает важность танца как средства культурной коммуникации. Символика, заложенная в танцевальных композициях, отражает культурные и исторические аспекты, связывая традиции с современными художественными тенденциями. Каждый танец несет в себе элементы национальных традиций, которые обогащают его содержание. Например, пасодобль, с его аллюзиями на испанскую корриду, передает элементы борьбы и триумфа, тогда как самба, вдохновленная бразильскими карнавалами, символизирует свободу и жизненную энергию. Эта культурная символика подчеркивает значение танца как способа сохранения и трансляции национальной идентичности, которая, несмотря на процесс глобализации, остается важной составляющей спортивных балльных танцев. Музыка как структурный элемент танца играет ключевую роль в формировании эмоциональной пластики и символики движений. Ритм и мелодия не только определяют темп и характер танца, но и задают его эмоциональный фон. Партнеры, интерпретируя музыкальные акценты через движения, создают гармоничное единство звука и пластики. Например, драматичность музыки танго усиливает эмоциональную напряженность движений, в то время как легкость и игривость квикстепа подчеркивают радостный и динамичный характер взаимодействия. Таким образом, музыка становится связующим звеном между техническими и художественными аспектами танца. Эмоциональная пластика танца позволяет зрителю глубже воспринимать его содержание, превращая физическое исполнение в форму художественного повествования. Через движения и мимику танцоры передают сложные чувства, такие как любовь, страсть, ревность или радость, что делает танец универсальным языком человеческих эмоций. Взаимодействие между партнерами усиливает этот эффект, создавая визуальные и эмоциональные образы, которые находят отклик у зрителей. Например, напряженный взгляд в танго или нежный жест в вальсе подчеркивают драматизм и искренность исполнения, что делает танец доступным и понятным для широкой аудитории. Современные тенденции в спортивных балльных танцах демонстрируют их способность адаптироваться к изменяющимся культурным и социальным условиям. Введение новых хореографических элементов,

заимствованных из других танцевальных стилей, таких как контемпорари или джаз, расширяет художественные границы танца, делая его более универсальным и актуальным. Технологии, включая цифровую визуализацию и социальные медиа, способствуют популяризации танцевального искусства, позволяя танцорам и хореографам делиться своими идеями с глобальной аудиторией. Это не только укрепляет роль спортивных бальных танцев как формы искусства, но и подчеркивает их значение как средства культурного диалога.

Таким образом, спортивные бальные танцы являются уникальной формой искусства, которая объединяет физическую выразительность, эмоциональное содержание и культурное богатство. Их анализ через призму партнерства, телесности, эстетики и символики позволяет глубже понять, как танец функционирует как метафора социальных взаимодействий и культурных процессов. Этот синтез искусства и спорта открывает новые перспективы для исследования, подчеркивая значимость танцевального искусства в современном мире. Спортивные бальные танцы, несмотря на строгие технические требования, продолжают оставаться средством художественного самовыражения, способным вдохновлять и объединять людей.

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Astronomy

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ABOUT DISCOVERING AND GETTING OF ALL NEW INFORMATION ABOUT THE NOW DWARF PLANET PLUTO

Vidmachenko Anatoliy Petrovych

Doctor Phys.-Math. Sci., Professor, Professor of Department of Physics
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine

Abstract

Thanks to the prediction made on the basis of the deviation of the apparent motion of the planet Uranus from the calculated position in the orbit, in 1846 the eighth planet – Neptune – was discovered. P. Lowell and W. Pickering, took up calculations of the possible position of new planetary bodies, based on deviations in the motion of planets and cometary bodies known at that time. In 1905-1916, P. Lowell conducted searches at his own observatory. When he died, P. Lowell bequeathed all his savings to the development of his observatory. A 32.5-centimeter astrograph was ordered especially for the continuation of the search for a new planetary body, which, with an exposure of one hour, allowed to register objects with a stellar magnitude of 17m. An amateur astronomer, Clyde Tombaugh, was specially invited to work with this equipment. It was he who, on 18.02.1930, after reviewing the photographic plates obtained on 23 and 29 January, discovered an object 15m, which was moving at a very low speed. This fact indicated that this celestial body was located beyond the orbit of Neptune. On 13.03.1930, on the 75th anniversary of the birth of P. Lowell and on the 149th anniversary of the discovery of the planet Uranus, the director of the Lowell Observatory, V. Slipher, announced the discovery of the ninth planet in the Solar System. On 25.05.1930, a general announcement was made of the proposal to name it Pluto. It was submitted and considered by the American and London Royal Astronomical Societies and unanimously approved there. Since the discovery of Pluto in 1930, there have been many facts indicating that it is significantly different from the rest of the planets in the Solar System. But only in the 1990s was it possible to accurately determine its small mass, and in the trans-Neptunian space, which is now called the Kuiper Belt, more and more celestial bodies began to be found. In 2006, the International Astronomical Union, at its General Assembly in Prague, approved a list of features according to which a planet should differ from non-planets. One of the features was the requirement that the planet "cleanse" the area in its orbit from other bodies. Since Pluto could not do this, on August 24, 2006, it began to be called a dwarf planet. In early 2006, the "New Horizons" spacecraft was launched to Pluto. On board were cameras, spectrometers, a device for scanning Pluto's thin atmosphere with radio waves, etc. The data obtained by them made it possible to obtain valuable information about the global geology and morphology of the surfaces of Pluto and Charon, to make their maps and to study Pluto's atmosphere.

Keywords: Pluto, dwarf planet, Kuiper belt, geological activity, surface morphology.

Thanks to the prediction made based on the deviation of the apparent motion of Uranus from the calculated position in the orbit, in 1846 it was possible to discover the eighth planet in the Solar System – Neptune [5, 6]. This prompted astronomers to search for new planetary bodies [17, 30] in this way, since even after accurately accounting for the perturbations caused by the motion of Neptune in its orbit, the deviations in the motion of Uranus, although significantly reduced, still remained noticeable. In 1848, B. Peirce drew attention to this. Several astronomers, including P. Lowell and W. Pickering, began calculations to predict new planetary bodies, based on the deviations in the motion of cometary bodies known at that time. P. Lowell (Fig. 1, left) did a great deal of work on calculating the orbit of a new planet, which he called "planet X", based on observations of deviations in the motion of the planet Uranus. He began his search in 1905 at his own observatory. But in 1916, P. Lowell became disappointed in his research and stopped searching. He died soon after. But P. Lowell bequeathed all his savings to the development of his observatory. However, continuing the search was prevented by a long lawsuit with the

scientist's widow, who tried to recover the money he had bequeathed to the now well-known observatory.



Fig. 1. On the left is Percival Lowell, on the right is Clyde Tombaugh with a homemade telescope.

It was possible to resume full-fledged work only in 1929. An astrograph with an aperture of 32.5 cm was ordered especially for the continuation of the search for a new planetary body. Photographic images taken with this device covered a section of the sky ($12 \times 14^\circ$); with an exposure of one hour, the minimum stellar magnitude reached 17^m. In January 1929, amateur astronomer Clyde Tombaugh was invited to the observatory especially to work with this equipment (Fig. 1, right). After the final adjustment of the telescope in April, he began photographing the starry sky. And although Pluto was already in the tenth photographic image, it remained unnoticed for some time. And only in September of the same year was it possible to establish a method for searching for objects moving across the sky.

It consisted in photographing sections of the sky at a point opposite the Sun three times, with an interval of several days. Then these photographic plates were compared on a blink comparator, and objects were searched for that had shifted relative to fixed stars during the time between the images received. Viewing the images received took a lot of time due to the huge number of stars. Therefore, only on 02/18/1930 K. Tombaugh on the plates received on 23 and 29 January discovered an object that was moving at a very low speed. This fact testified that this celestial body was located beyond the orbit of the most distant planet at that time - Neptune. This object was then in the constellation Gemini and had a magnitude of 15^m. This was 2^m weaker than previously expected according to calculations.

03/13/1930, on the 75th anniversary of the birth of P. Lowell and on the 149th anniversary of the discovery of the planet Uranus, the director of the Lowell Observatory V. Slipher announced the discovery of a ninth planet in the Solar System [15, 16, 26]. It was stated verbatim as follows: "A systematic search for many years, complementing Lowell's research of a trans-Neptunian planet, has led to the discovery of an object which, for seven weeks, had a velocity and trajectory consistent with that of a trans-Neptunian body" [1].

For almost half a century after this point, estimates of Pluto's mass were revised downwards [4]. It was only in 1978 that the discovery of the moon Charon [27, 28] made it possible to measure [2] its mass with a fairly high accuracy for the first time. It became clear then that such a small value, which was about 0.002 of the mass of our Earth, was too small to cause a noticeable perturbation in the orbit of the planet Uranus. Therefore, the search for another "Planet X" was launched, which was still fruitless [19, 21, 23].

Thanks to the flyby of the spacecraft "Voyager-2" in 1989 near Neptune, it was possible to clarify the mass of this planet. It turned out to be almost half a percent less than that which was previously

considered correct. Therefore, calculations carried out in 1993 by the American astronomer Erland Myles Standish using these updated data practically nullified the possible gravitational influence of Neptune on the motion of Uranus. In this regard, the urgent need for the existence of a "planet X" disappeared [11].

According to tradition, the right to name the new celestial body belonged to the Lowell Observatory. P. Lowell's widow, Constance, suggested such names as "Zeus", "Percival" and "Constance". However, all these options were ignored. Three such proposals were received from the observatory workers: "Minerva", "Cronus" and "Pluto". As a result of the voting, almost all the votes were given to the last option [12]. The proposal for this name was first published by V. Slipher on 1.05.1930 [9]. And on 05/25/1930, a general announcement of the proposal took place, and it was submitted for consideration to the American and London Royal Astronomical Societies. Both of these organizations unanimously approved it.

According to Slipher's later reports, the name "Pluto" was first suggested to him on 03/14/1930 by an eleven-year-old schoolgirl from Oxford – Venetia Burney. She was interested in astronomy and classical mythology. The astronomical symbol for Pluto is a nomogram of the Latin letters P and L. They are the first letters in its name and the initials of the founder of the observatory, Percival Lowell.

Since the discovery of the Pluto object in 1930, there have been many facts indicating that it is significantly different from the rest of the planets [3, 7, 8] in the Solar System. Indeed, unlike the practically circular orbits of all other planets, it revolves around the Sun in a very elongated orbit with an eccentricity of 0.25. And the inclination of its orbit to the ecliptic plane of 17° is quite significant, compared to no more than 7° for the orbits of all other planets. But until a certain time, such differences were not considered critical.

Indeed, in 1978, the satellite Charon was discovered around Pluto, observations of Pluto's coverage of stars allowed us to detect a rarefied atmosphere around it [25], the main component of which was molecular nitrogen. And the surface layer of Pluto mainly consisted [22, 23] of frozen molecular nitrogen and methane, and mountain ranges of frozen water [24, 29]. Since Pluto is quite small, and it is very far from the Sun, it was practically impossible to learn more about it from Earth. Even with the Hubble Space Telescope, images of its surface were obtained only with very low resolution. Although it was possible to notice several dark and bright spots on the surface.

Why did Pluto cease to be a planet and become a dwarf planet?

In the middle of the 20th century, it was suggested that there was "construction debris" beyond Neptune's orbit from the formation of the Solar System. But only in 1992 was it actually possible to discover the first trans-Neptunian asteroid. After that, similar discoveries followed one after another. And in the trans-Neptunian space, which is now called the Kuiper Belt, an increasing number of rather large bodies began to be found. That is, Pluto ceased to be a unique object in its environment. And this significantly distinguished it from other planets in the Solar System.

In addition, in 2005, another trans-Neptunian object comparable in size to Pluto was discovered – Eris [18]. Therefore, the question arose, what exactly should be called a planet? The International Astronomical Union, at its General Assembly in 2006, which was held in Prague, approved a list of features according to which a planet should differ from a non-planet. And one of these features was the requirement that a real planet "clear" the area in its orbit of other bodies. Pluto could not cope with this task [10] and on August 24, 2006, it became a dwarf planet.

On January 19, 2006, a new, cosmic stage in the study of Pluto began. It was then that the "New Horizons" space probe was launched to it. After launching from Earth, in early 2007, the spacecraft performed a so-called gravitational maneuver near Jupiter [13, 14, 20, 21, 26]; this gave it additional acceleration. Planning such a maneuver allowed the probe to significantly save on fuel and increase the mass of the installed scientific equipment. During the gravitational maneuver, the operation of all seven scientific instruments of the probe was checked.

Some of them were intended to obtain images in different wavelength ranges, others studied the properties of the surrounding plasma. On board the space probe were cameras, spectrometers, a device for scanning Pluto's thin atmosphere with radio waves. The data obtained by them allowed to study the global geology and morphology of the surfaces of Pluto [20] and Charon, to make maps of them and to study Pluto's atmosphere. The maximum approach to Pluto occurred on July 14, 2015, when the "New Horizons" probe flew only 12,472 km from the surface (Fig. 2).



Fig. 2. Pluto's image taken by "New Horizons" on July 14, 2015, from a range of 35445 kilometers (https://en.wikipedia.org/wiki/Pluto#/media/File:Pluto_in_True_Color_-_High-Res.jpg).

Scientific observations of Pluto began 5 months before this moment and continued for at least another month after the approach. Within a few hours, the scientific instruments of the apparatus conducted a significant number of the most diverse observations and accumulated a huge amount of information. All the information was transmitted to Earth only at the end of 2016. The shape of Pluto turned out to be almost perfectly spherical, completely unexpectedly.

Quite unexpected was the finding of the most diverse landforms on Pluto. Especially unexpected was the finding of long flat areas on which not a single impact crater was found. And the huge plain turned out to be divided into peculiar cells, which indicated the existence of possible convective movements in the ice layer (Fig. 3). All this indicated the relative youth of these areas of the surface. This plastic ice could consist of frozen molecular nitrogen and carbon monoxide. However, for such processes to occur, a sufficiently powerful source of internal energy is required.



Fig. 3. Sputnik Planitia is covered with churning nitrogen ice "cells" that are geologically young and turning over due to convection (https://en.wikipedia.org/wiki/Pluto#/media/File:Pluto%E2%80%99s_Heart_-_Like_a_Cosmic_Lava_Lamp.jpg).

Despite the enormous thinness of Pluto's atmosphere [15], it was found to be capable of supporting a haze that extended to a height of almost 150 km from the surface (Fig. 4). All these facts have raised a huge number of questions for researchers that will need to be answered in the future.

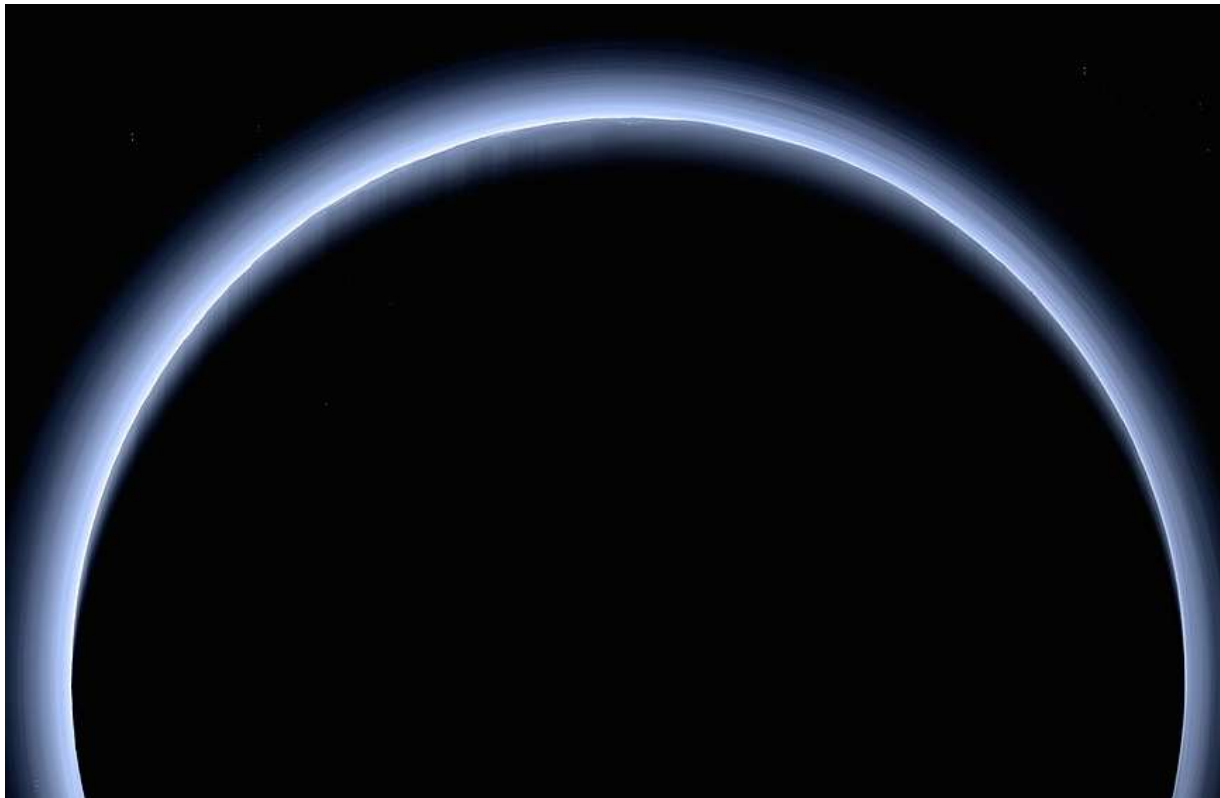


Fig. 4. A near-true-color image taken by New Horizons after its flyby. Numerous layers of blue haze float in Pluto's atmosphere. Along and near the limb, mountains and their shadows are visible (https://en.wikipedia.org/wiki/Pluto#/media/File:PIA21590_%E2%80%93_Blue_Rays,_New_Horizons'_High-Res_Farewell_to_Pluto.jpg).

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Biological sciences

IDENTIFYING NEW OPPORTUNITIES FOR TEACHING THE 'CLASSIFICATION OF LIVING ORGANISMS' UNIT USING GAME-BASED TECHNOLOGY IN BIOLOGY LESSONS

Istleuova Asylai Bagdatovna

*2nd year Master's degree student of
Abay Kazakh National Pedagogical University,
Almaty, Kazakhstan*

Zhumagulova Kalampyr Abzhapparkyzy

*Associate Professor, Candidate of Biological Sciences,
Abay Kazakh National Pedagogical University,
Almaty, Kazakhstan*

Abstract

The "Classification of Living Organisms" unit in biology provides foundational knowledge that is essential for understanding the diversity of life. However, traditional teaching methods can sometimes struggle to engage students with the complexity of taxonomy and classification systems. Game-based learning (GBL) technology offers innovative opportunities to enhance student engagement, understanding, and retention of these concepts. This paper explores the potential of game-based technology to teach the classification of living organisms by identifying novel opportunities and strategies for its implementation in biology lessons. Interactive platforms such as Kahoot!, Quizlet, and Minecraft Education Edition, as well as specialized educational games like BioMan Biology, offer dynamic, immersive, and interactive experiences that can simplify complex biological categories, such as Kingdoms, Phyla, and species identification. By incorporating competitive elements, rewards, and immediate feedback, these tools foster active learning and motivation, helping students better grasp the hierarchy of biological classification. Moreover, GBL encourages collaboration and problem-solving, allowing students to work in teams to categorize organisms or simulate classification processes in real-world contexts. The integration of game-based learning into biology classrooms not only makes learning more enjoyable but also enhances cognitive engagement and critical thinking. This paper examines the effectiveness of GBL in the "Classification of Living Organisms" unit, proposing new methodologies for creating immersive, student-centered lessons that increase interest, understanding, and mastery of key biological concepts

Keywords: game-based learning, classification of living organisms, taxonomy, biology education, interactive learning, educational technology, student engagement, problem-solving, collaborative learning, digital tools, gamification, teaching strategies

INTRODUCTION

Today, in connection with major changes in the development of society and in accordance with new requirements, the main goal that the education system sets for itself is the formation of a person with deep critical thinking.

In this regard, in the world educational space, there is a need to train specialists who are not limited to mastering a set of information, but can effectively organize their activities independently, quickly adapt to everyday changes, work creatively, are passionate about comprehensive integration knowledge, are able to create creative actions on their own, have a mature personal quality of being, and are able to organize education from a research point of view. In accordance with the state standard of education in the Republic of Kazakhstan, the requirements for education in higher educational institutions are radically changing, and the priority is not to equip the student with a certain set of subject knowledge, skills and abilities, but to implement the goal of forming their educational, cognitive, research activities[1].

Through research activities, the student's scientific worldview develops. The scientific worldview is formed not only through the acquisition of theoretical knowledge, but also as a result of consistent arguments and research activities. As a result of independent research activities, students are convinced of the real reality. This sets the task for pedagogical universities to master the methods of forming research activities in the preparation of future teachers[2].

RESEARCH METHODS

(1) Forming Small Groups

We may decide to devote all or part of a class session to research works, but students must form small work groups during that time. We can ask the students to form groups of 3-5 people, or assign the groups ourselves.

(2) Presenting the Problem

Present the students with a brief problem statement (preferably on a printed work sheet, an example of which is shown below), e.g., "A 28-year-old man appears to have osteoporosis." In some cases a video clip or specimen might be used as a trigger. Emphasize to the students that they are dealing with an authentic case history[4]. Bizarre problems work best. Prior to class you should review the case history and arm yourself with data that can be released incrementally (progressive disclosure) as the case proceeds. Needless to say, the students should not be given the reference, as the objective is to solve a problem, not read a solution.

(3) Activating the Groups

Ask the groups to brainstorm possible causes of the osteoporosis. Each group will have to discuss, review, or investigate the biology of bone, including the role of osteoblasts, diet, vitamin D, parathyroid hormone, growth hormone, calcitonin, kidney function, etc. This is when much learning occurs, as the students help each other understand the basic biology. Olympiads must reflect upon biological mechanisms rather than just memorize facts (as might occur in some traditional lecture-only courses). The instructor circulates among the groups, providing assistance but not solutions. The groups may well explore avenues unanticipated by the instructor. This is highly desirable and should not be discouraged. The instructor should avoid controlling the agenda of the groups[5]. Each group ranks its hypotheses in order of priority and prepares requests for more data. (E.g., for calcium deficiency hypothesis – "What did he usually eat?")

(4) Provide Feedback

Ask that a rep from each group place their top priority hypothesis or data request on the chalkboard (if already entered by another group, place their second choice, etc.). If this is not practical, ask for oral suggestions from the groups when the small group work is halted and the class is reconvened. Student suggestions may include[3]:

- ✓ Low calcium diet
- ✓ Immobility
- ✓ Low density of vitamin D receptors
- ✓ Calcitonin deficiency
- ✓ Excessive PTH
- ✓ Chronic acidosis buffered by salts mobilized from bone

The small group work can be stopped and the instructor can briefly discuss the ideas with the entire class. It is important to value every contribution, to assist the students in analysis of the biology involved, and to provide further information [he was not immobile, he had a normal diet, etc.]. The students can be prompted for data requests: "If you could ask for just three test results from examination of this man, what would they be?"

It is not likely that the students will solve a problem on the first pass, and the feedback from the instructor motivates the next round of small group work. The students could now be told that the man's lumbar spine density is 3.1 standard deviations below the average age-matched healthy female (osteoporosis = 2.5+ SD), his height is 204 cm, his left middle finger is 10 cm, and knee films show open epiphyses[6]. The cycle of small group work and instructor feedback can be continued during the current class session or on future occasions. The key to managing a PBL session is providing continual feedback to maintain student enthusiasm while simultaneously prolonging the resolution of the problem to ensure that adequate learning occurs.

Unlike simple tests and tests, project and research activities, various intellectual competitions, writing essays, Olympiads cover a wider range of knowledge in general education subjects and contribute to a wider erudition.

Preparation for the Olympic movement should be serious, long-term and systematic. In order for a 9th grade student to show decent results, it is necessary to start at least from the 6th grade.

1. Olympiad tasks form three groups:

Part 1 – tasks with the choice of one correct answer out of four;

Part 2, 3 – tasks with a choice of multiple answers or matching.

2. 25% of the tasks on the knowledge of the subject in the framework of an in-depth school curriculum.

3. 50% of knowledge assignments are outside the school curriculum.

4. 25% of tasks are for the application of knowledge in a non-standard situation, data analysis and problem solving.

As you can see, the knowledge that the guys receive in the lessons is not enough. Additional extra-curricular training is needed.

Next, I conduct the selection of students and the formation of a school team of students who want and can engage in serious training in the subject.

We are planning work.

-creation of individual educational trajectories;

-the predominance of individual forms of work over group ones;

-close interaction of older students with younger ones.

When planning work with a group of schoolchildren, formalism and excessive organization should be avoided. Taking into account different ages and different levels of training, it would be optimal to build individual educational trajectories for each participant, and the student should be given the freedom to choose this trajectory. This implies free attendance of most classes, free choice of the direction of cognitive or research work. Students can come to class to get a brief consultation and a task for individual work, to get help in carrying out project work, mini-groups are gathered to solve biological problems, discuss theoretical issues. Seniors can, solving their tasks, act as consultants and supervisors for the younger ones. The teacher consults individual students or talks with mini-groups, outlines the prospects and goals of further training[7].

The goals may be different, as a rule, it is a generalization, systematization of the material, or, conversely, a leading question before studying a new topic. In search of the necessary information, a variety of sources are "shoveled", the necessary skills are acquired, and the products created at the same time are then used as reference materials. Much attention is paid to working with educational and reference literature on ecology, because this subject is not studied in our school, and schoolchildren show great interest in it.

Currently, along with books, perhaps an important role is played by such a source of information as the Internet. Electronic versions of books, journal articles, various tests, tasks of Olympiads of various levels can also be found on various biological sites. Is it possible and necessary to manage this flow of information? In any case, it is advisable to familiarize students with a list of biological sites where they can find useful information for themselves. One of these sites is undoubtedly www.kpdbio.ru, where resources are placed to prepare for the regional stage in biology. On this site, you can get online advice on a question of interest, test your knowledge by performing test tasks of previous years, watch a video tutorial.

Conclusion

When analyzing the past Olympiads, omissions, shortcomings, findings that were not taken into account in the previous activities of both the teacher and the student are revealed. This principle is mandatory for teachers, as it will positively affect the quality of preparation for the Olympiad. But it is also necessary for students, as it helps to increase the strength of knowledge and skills, develops the ability to analyze not only successes, but also shortcomings.

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Chemical sciences

COLLAGEN – GENTAMICIN COMPLEXES IN BIOMEDICAL APPLICATIONS

G.V. Ibrahimova¹
S.S. Fatullayeva¹
Sh.D. Tagiyev²
N.A. Zeynalov¹
D.B. Tagiyev¹

¹Catalysis and Inorganic Chemistry Institute named after academician M. Nagiyev of Ministry of Science and Education of the Republic of Azerbaijan, 113, H.Javid ave., Baku, 1143, Azerbaijan

²Azerbaijan Medical University, 23, Bakikhanov str., Baku, 1022, Azerbaijan

Gentamicin, a broad-spectrum aminoglycoside antibiotic, remains a cornerstone in the management of bacterial infections due to its potent antimicrobial efficacy, particularly when combined with biomaterials such as collagen. Collagen, owing to its intrinsic biocompatibility, biodegradability, and favorable physicochemical properties, serves as an ideal drug delivery matrix, enabling controlled and sustained release of therapeutic agents. The interaction between gentamicin and collagen has led to innovative developments in drug delivery systems, wound healing, and surgical site infection prevention. Gentamicin-collagen composites enable targeted drug delivery, reduce systemic side effects, and enhance therapeutic efficacy by acting directly at the site of application. These biomaterials not only provide controlled drug release but also support tissue regeneration, making them ideal candidates for various biomedical applications [1,2].

Studies have shown that gentamicin-impregnated collagen can significantly reduce infection rates in surgical sites, as demonstrated in vascular surgery and abdominal procedures. While gentamicin-collagen systems have shown promising results, challenges remain regarding their long-term stability, biodegradation, and in vivo efficacy. Future research should focus on optimizing the formulations, ensuring biocompatibility, and exploring their potential in advanced drug delivery and tissue engineering applications. Overall, the integration of gentamicin with collagen represents a significant advancement in biomedical materials, offering effective solutions for infection control and tissue repair. The synergistic utilization of collagen-based carriers and advanced vesicular systems, such as transferosomes, represents a promising strategy to overcome limitations associated with systemic antibiotic therapies [3]. By providing localized, sustained, and targeted drug delivery, these systems offer safer and more efficacious alternatives for infection management, particularly in surgery and postoperative care [4]. Future research should prioritize the optimization of these delivery platforms to ensure translational success in clinical practice, addressing current challenges in infection prophylaxis and treatment. Complex drugs with specific properties are created by immobilizing various drugs (anticoagulants, glycosaminoglycans, antiseptics, antibiotics, enzymes, antioxidants, regeneration and osteogenesis stimulants, etc.) on collagen. In this regard, research work devoted to the synthesis of the collagen-gentamicin complex and the study of its biological activity is very relevant and practical.

Keywords: Gentamicin, Collagen, Antibiotic, Biomaterial, Drug Delivery Systems, Wound Healing, Surgical Infections.

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Cultural sciences

METHODS OF STUDYING PHRASEOLOGICAL UNITS: SIMILARITIES AND DIFFERENCES BETWEEN PAREMIES AND IDIOMS

*Mamasheva Oktomkan Torobekovna
Mamaeva Khankhada Talantbekovna
Muratbekova Aichurok Shermamatovna
teachers of Osh State University*

ФРАЗЕОЛОГИЯЛЫК БИРДИКТЕРДИ ИЗИЛДӨӨНҮН МЕТОДДОРУ: ПАРЕМИЯЛАР МЕНЕН ФРАЗЕОЛОГИЗМДЕРДИН ОКШОШТУКТАРЫ ЖАНА АЙЫРМАЛАРЫ

*Мамашева Октомкан Торобековна
Мамаева Ханхада Талантбековна
Муратбекова Айчурок Шермаматовна
Ош мамлекеттик университетинин окутуучулары*

Abstract

The similarities and differences of paremias and phraseologisms were considered with examples. Attention was paid to the nature and semantics of stable units in linguistics. Research methods: the use of descriptive, historical, stylistic methods in our work. The object of our work: paremias and phraseologisms, and then as a subject - the similarities and differences of phraseological units. Paremias (proverbs) and phraseologisms are a unique layer of language that reflects the past history, culture, customs, traditions of the people. The concept of "culture" includes a broader meaning than that used in everyday life.

Аннотация

Паремиялардын жана фразеологизмдердин окшоштуктары жана айырмачылыктары мисалдар менен каралды. Тил илиминдеги туруктуу бирдиктердин табиятына, семантикасына көңүл бурулган. Изилдөө ыкмалары: ишибизде сыпаттоо, тарыхый, стилистикалык ыкмаларды колдонуу. Ишибиздин объектиси: паремиялар жана фразеологизмдер, андан соң субъект катары – фразеологиялык бирдиктердин окшоштуктары жана айырмачылыктары. Паремиялар (макал-лакаптар) жана фразеологизмдер – элдин өткөн тарыхын, маданиятын, үрп-адатын, каада-салтын чагылдырган тилдин кайталангыс катмары. «Маданият» түшүнүгү күнүмдүк турмушта колдонулганга караганда кененирээк маанини камтыйт.

Keywords: culture, language, method, nation, paremia, phraseologism, world.

Негизги сөздөр: маданият, тил, ыкма, улут, паремия, фразеологизм, дүйнө.

Culture is a generalization of the way of life of mankind. Language is a reflection of the information of the culture of the people. The process of a person's cognition of the environment, his introduction to cultural values (material and spiritual) occurs only in the process of mastering the language and only through it (p. 2-240).

Therefore, language is not just a symbolic code, but a keeper of the spiritual heritage of previous generations, a transmitter of the values of the national culture of a certain community of people speaking the same language. Phraseologisms and paremias are living evidence of the past. Therefore, knowing the history of their origin enriches our mind. By mastering our native language, a person becomes the owner of his national culture. The Greek word paremia, which corresponds to the proverbs and sayings in the Kyrgyz language, is called by the Turkic term "otalar suzi", that is, the word of the fathers - the wisdom of the fathers, the wisdom of the ancestors, the advice and advice. Paremias, which are short, concise and at the same time concise, and have the character of a model of thought, increase their educational value. Paremia expresses certain ideas about reality. It characterizes people, things and phenomena, gives clear and precise positive or negative assessments. It educates the humanistic ideals and noble moral qualities of a person. Social injustice, suffering from life, the people's desire for justice - all this prompted the creation of short, purposeful, figurative sayings about wealth and poverty, about truth and falsehood,

good and evil, work and laziness. It also speaks about friendship and love, about knowledge and ignorance. Such motivation of paremias led to the expansion of the scope of their use.

Research results. Phraseology is defined in the linguistic dictionary as follows; a set of stable and characteristic sentences of a language. Phraseologisms are also one of the most frequently used means of emotional-expressive meaning. T. N. Fedulenkova calls phraseological units phrases that convey a transitive meaning (6, p. 146).

To be carried away - (to be very fond of something); to be carried away by someone - (to believe in someone). Phraseologisms and paremias are types of stable phrases. Each of them has its own characteristic structure, semantic and functional features. Proverbs perform an educational function, teach what a person should do and how to be in various situations. Unlike phraseologisms, which reflect literary studies, linguistics, and ethnography, paremias also reflect folklore. Paremias can be a whole text and contain a single complete thought. Phraseologisms, on the other hand, indicate only linguistic units.

Phraseologisms as members of a sentence. These stable word combinations in the language perform one of the members of a sentence. Phraseologisms can be the main members of a sentence: possessive or predicate. They also perform the function of declarative members in a sentence. Examples of sentences in which phraseological units can be emphasized as members of a sentence: Unexpectedly, unpleasant news has freed our generation. The phraseologism "to free the generation" in this sentence answers the question of what happened and performs the function of a narrator in the sentence. It seems that he did not cut his nose with an axe. The phraseologism "not to cut his nose with an axe" in this sentence answers the question of what and performs the function of a determiner in the sentence.

Stability in phraseologisms is also characteristic of proverbs. The order of words in proverbs and sayings, or rather, a word cannot be replaced by another word. Proverbs are complete sentences that express a certain syntactically complete thought. For example: When you see the door, go to the place, when you see the mother, go to the daughter. A man is on the outskirts, on the battlefield. A guest stays for one day, a guest stays for two days, he dies. Let's dwell on the last of the proverbs cited above. The word guest in this proverb is the syntactical owner of the sentence. However, the phrase "one day" here is a tense-fixing, while the phrase "konso" in a complex sentence, and the phrase "kut" in a complex sentence are narrative.

Proverbs are also stable, that is, the words in them cannot be replaced by other words. The word "war" in the proverb "a man is on the outskirts, on the battlefield" given above also corresponds to the meaning of war. However, we do not use the proverb "a man is on the outskirts, on the battlefield." Because proverbs are absorbed by the ear and are always repeated in the mouth of the people without changing. In the same proverb, the word чөтөндө The proverb "Be close to good, stay away from bad" is completely stated in the proverb, without changing any personal pronouns, and only then the words "say" or "say" are used as in the proverb. However, if we turn the phraseologism, which includes the stable phrase "not yet grown up", which means "young, immature", into a sentence expressing a syntactically complete thought: "He is a child who has not yet grown up", or "He got involved in life when he was still young - it was a life experience for him", it can be used in various sentences.

"It is impossible to draw a clear and unambiguous line between proverbs and sayings" (E. A. Lyapky). A proverb can be in the form of a simple or complex sentence. A proverb, which is a short folk proverb, is used to confirm, describe or characterize a phenomenon, event, situation, while sayings do not have a didactic character. Nicknames, like proverbs, can be in the form of simple or complex sentences. Thus, at the semantic level, proverbs and nicknames have differences and features, but proverbs and nicknames are the same in syntactic analysis. Nicknames constantly appear in everyday life based on the positive or negative actions of people.

Here, in fact, our poet Toktogul was in love with Alymkan and was sick for a day and well for a day. However, in the people's mouths, this nickname is pronounced by the name of Alymkan. People are afraid that if they do some unpleasant work, they will become a nickname for the people, saying "so and so" - they will be scattered to the ends of the earth. As mentioned above, good deeds or good qualities of people can also become nicknames. For example, Aiköl Manas, the world giant - Aitmatov, etc. In our people, a person who continues to do any work or is forced to do it under any circumstances is called Badalbai, who is in trouble (Badalbai is an episodic character. The horseman who brought the heart of the tiger to Chyyirdy, who was wounded by the tiger's black arrow) (3- 1, 51 - 53).

Summing up this part of the work, we made the following statement. Phraseologisms and paremias are short and concise, used as ready-made means of expression in the language. They differ only in their structure, semantics, and functional features.

In expressing the same idea, the worldview, outlook on life, and perception of the surrounding environment of the Kyrgyz, Russian, and English peoples are shown by comparing the equivalents of phraseological units in three languages. Since phraseological units are often not directly translated into another language, only their equivalents in other languages can be found. Here, examples were studied, found, and compared, in which stable expressions expressing the same meaning strikingly demonstrate the peculiarities characteristic of that people in each language. Particular attention was paid to the emergence of phraseological units in peoples and their analysis was carried out.

The content of phraseological units, the reality of life, and phenomena used in them are closely related to the picture of the world of peoples, the peculiarities of their mentality.

The picture of the world of each ethnic group contains basic concepts that are especially important for that nation. The meanings reflected in it are included in a single belief system for native speakers. For each people, the way of conceptualizing reality is universal and national. Therefore, we can say that speakers of different languages see the world through the prism of their own language. The linguistic picture of the world of peoples depends on many factors. These are the lifestyle of people and their relations with other peoples, the geographical location of the country where the speakers of their native language live, their social, political and family privileges, etc. Studying phraseological units, we come to the conclusion that the lifestyle and geographical location of the country are of particular importance for the linguistic picture of the world.

The vast expanses of the Russian land, its boundless forests, fields, wide rivers make it possible to speak about the breadth, courage and scale of the soul of the Russian people. The English live on an island surrounded by the sea. These boundaries seem to limit them, and the English are restrained, strict in their customs and traditions, and it can be said that they are a refined people. And the Kyrgyz led a nomadic lifestyle, which gave them a certain lack of accuracy in character, but at the same time freedom-loving and courageous. Most English phraseological units are associated with the sea, fishing, ships, etc. Kyrgyz phraseological units are full of concepts related to livestock, the main character of life. Russian phraseological units reflect various aspects of life and allow the use of various realities, since the geography of Russia and its way of life are associated with the seas, livestock farming and agriculture.

Language is the highest call of the people, from which the nature, inner feelings and life of the people are heard (P. Vyazemsky). One of the most interesting topics in linguistics, in our opinion, is phraseology. Phraseology (Greek phrasis - expression, logos - science) is the science of linguistic unity, the structure of which is complex, stable in nature. Phraseological units are a means of expressing thought beautifully, accurately and imaginatively, forming an inseparable whole, consisting of stable phrases, which are readily used in speech. Phraseology has great potential for research and new discoveries. If we compare phraseological units to fabric, we can consider them as threads that give the fabric its unique color and beauty. The stable expressions of different peoples reflect the attitude, outlook and philosophical thinking of that people towards the universe, nature, humanity, the environment around us, as well as the animal world, distinguishing them from other peoples, reflecting their spiritual culture and mentality. Of course, phraseological units of any language are the best linguistic means of that language. Sometimes it is not easy to determine the source of phraseological units. However, knowing what they mean, it is even more interesting to know where they came from.

Phraseologisms have been used since the emergence of language, embodying the centuries-old experience of the people and passed on from generation to generation. The use of certain words in phraseologisms, their transformation into stable expressions, and their use as a ready-made means in speech reflect the attitude, outlook and philosophical thinking of that people to the universe, nature, humanity, the environment surrounding us, as well as the animal world, distinguishing that people from other people, expressing their spiritual culture and mentality. Therefore, no matter what language phraseologisms are, stable expressions are the best linguistic means of that language. Phraseologisms are a living testimony to the past. Therefore, knowing the history of their origin enriches our mind. Phraseologisms are used in the transitive meaning of the word.

They cannot be directly translated into another language, since the meanings of phraseologisms are based on national specifics. They can only have equivalents in another language. Getting acquainted with the phraseological units of different peoples helps to learn more deeply about the history of that people. At the same time, phraseological units are a valuable tool in studying the country. Because they clearly show ethnolinguistic components.

The first study on phraseology in general linguistics belongs to the Swiss scientist S. Bally. His work was published in French in 1901 under the title (French stylistics). Russian linguists became aware of this work after it was translated in 1905. The most important work on phraseology in Russian linguistics

belongs to V. V. Vinogradov. His report on the topic "Basic concepts of Russian phraseology as a linguistic discipline" at the scientific session in Leningrad in 1946 went down in history as a major innovation in linguistics. In his report, he noted that although there have been several studies on phraseology in the previous linguistic literature, phraseology has been considered only within the framework of lexicology, and emphasized that from now on this unit of language should be studied as a separate field in linguistics, and phraseology should be recognized as a branch of linguistics.

In the phraseology of the Russian language, the work of Professor N. M. Shansky entitled "Phraseology of the Modern Russian Language", the works of Professor V. P. Zhukov entitled "On the Question of the Multiplicity of Phraseologisms", "Semantics of Phraseological Turns", and the work of Professor A. I. Molotkov "Fundamentals of Russian Phraseology", published in 1977, occupy a special place. A. Shukurov was the first to conduct a scientific study of phraseology in the Kyrgyz language. His article "On Phraseological Combinations in the Kyrgyz Language", published in 1956, is the first work in the Kyrgyz language dedicated to phraseology. Scientific works on phraseology have been developed and many articles have been published in both general linguistics and Turkology (including in the Kyrgyz language). Phraseologisms have been studied from all sides. As a result, phraseology has become a branch of linguistics that studies stable phrases, which are separate artistic means of speech in the language. The object of study has been clarified. After J. Shukurov, J. Osmonova, J. Mamyrov, J. Mukambaev, J. Suranchieva, A. Nazarov, J. Chymanov, R. Toksonaliev, R. Egemberdiev, etc. scientists contributed to this work. Even now, this branch of our language is being studied from a scientific, theoretical, practical, and methodological point of view. As an example, we can mention the "Phraseological Dictionary of the Kyrgyz Language", which was replenished in 2001 by J. Osmonova, K. Konkobaev, and J. Japarov and includes 7980 stable phrases.

Phraseologisms of each nation are related to the lifestyle and location of that nation. For example, since the Kyrgyz land is mountainous and the people are engaged in livestock farming, their worldview and worldview are connected with livestock farming. When the Kyrgyz people ask for etiquette, they first ask about their livestock, and then about their health. Because almost all their livelihoods were related to livestock. This phraseology is still widely used today. The Kyrgyz lived a nomadic life, spending the winter in winter and the spring in pastures. Their main occupation was livestock farming. For nomads, the horse is a versatile animal that serves as a vehicle, a hunter, a sacrifice for celebrations, and a participant in various games (black wolf, horse racing, goat wrestling, etc.). Therefore, the stable expression "a horse, a horse after a horse" appeared for a reason.

We will talk about phraseology that summarizes the life and character of the Kyrgyz, Russian and English peoples. Let's look at the life, history, and worldview of the Kyrgyz people in the stable expression "A guest who stays for one day is welcome, but a guest who stays for two days is a loser." This phraseology includes the hospitality of the people and, as mentioned above, the livestock farming characteristic of the Kyrgyz people.

First, let's look at the meanings of the words in this phrase. The word "kut" means happiness, success, and prosperity. The word "zhut" means the death of livestock due to lack of food.

If there are people in the world who are great in hospitality, then the hospitality of the Kyrgyz people also occupies a special place among them. It is worth saying that there are many aspects to talk about this. The Kyrgyz people are hospitable by nature. They welcome guests in any situation. Even when they lived a nomadic life, they valued hospitality. If guests came on horseback, the host would ask them: "What kind of grass does your horse chew?" If the guest was: "My horse eats clover grass," "My horse eats sedge grass," they would say. In this regard, horses were taken care of and tied separately.

This ancient custom, which is widespread today, is to slaughter a sheep or horse and honor the guest with a bone marrow bone. The bone marrow is prepared according to the age of the guest and its importance to the family that is expecting the guest, namely, the kuymulchak, yambash, joto bone, kashka bone, karzhilik, and dali, and it is preserved and presented to the guests in the following order. As we all know, the nomadic Kyrgyz people lived in yurts. The entire family would sleep in one house. If there was a bride or an adult girl in the house, a curtain was drawn in one corner of the yurt. The bride and groom would undress and dress behind that curtain. A guest who came to the house of the Kyrgyz people, who did not stay without a guest, also slept inside that house. After eating, a place should be prepared for the guest to sleep. At that time; "Guests, come outside, let's make a bed" was certainly awkward and rude.

Therefore, it is said figuratively and politely, "Do the guest ritual." "Kaada" is derived from the Arabic word "kagida," which means "rule, ceremony." "Doing the guest ritual" includes the meanings of going out, performing ablution, and making room for a guest.

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Economic sciences

STUDY ON THE IMPACT OF DEMOGRAPHIC TRANSFORMATION ON CHINESE ECONOMIC GROWTH

Wang Xingguo

Student, Al-Farabi Kazakh National University
Kazakhstan, Almaty

Nietalina Gaukhar

Tutor, Al-Farabi Kazakh National University
Kazakhstan, Almaty

Abstract

This study aims to delve into the impact of demographic transformation on Chinese economic growth. Through a multi-dimensional analysis of population age structure, urban-rural structure, and educational structure, the economic effects of demographic changes on labor supply, consumption patterns, technological innovation, and industrial restructuring are revealed. The research finds that demographic transformation has both opportunities and challenges for Chinese economic growth. On the one hand, population aging leads to a reduction in labor supply and rising labor costs, posing certain pressures on economic growth. On the other hand, the improvement of population quality and optimization of the educational structure provide strong support for economic transformation and upgrading and innovation-driven development. Additionally, changes in the urban-rural population structure have also promoted the coordinated development of regional economies to a certain extent. This study provides theoretical support and practical guidance for China to formulate more targeted population and economic policies.

Keywords : Demographic transformation; Economic growth; Labor supply; Consumption patterns; Technological innovation

Chapter I Analysis of the Current situation of Population Transformation in China

Chinese population transformation process is complex and unique, undergoing a process from free migration to restricted migration, and then to full free migration. With the deepening of the reform and opening up and the development of the economy and society, Chinese population transformation presents a new characteristics of the current situation, which has had a profound impact on the economic growth. This section will provide an in-depth analysis of the current situation of the population transition in China to better understand its impact on economic growth.

1. Population migration and flow are highly active

Since the reform and opening up, Chinese population migration and flow has entered a new stage of development. A large number of people have moved from rural areas to urban areas and from less developed areas to developed areas, seeking better employment opportunities and living conditions. This migration flow not only accelerates the urbanization process, but also promotes the optimal allocation of the labor market. However, this has also brought about a series of problems, such as the gap between urban and rural areas, regional development imbalance and so on.

2. The scale of the floating population continues to expand

With the acceleration of urbanization, the scale of the floating population in urban areas continues to expand. These floating population mainly come from rural areas and underdeveloped areas, and they have made great contributions to the economic and social development of the cities. However, due to the restrictions of the household registration system and social security system, the floating population still has many difficulties in enjoying urban public services, social security and other aspects.

3. The population is aging

The aging trend of the population in China is increasing, and the proportion of the elderly population is increasing. This is mainly attributed to the implementation of the family planning policy and the improvement of medical and health conditions. The aging of the population has many effects on economic growth, including the reduction of labor supply, the change of consumer demand structure, and the increasing burden of social security.

4. The quality dividend of the population is gradually emerging

Although Chinese demographic dividend is gradually disappearing, the demographic quality dividend is gradually emerging. With the improvement of education level and the improvement of talent training mechanism, the quality of Chinese labor force has been constantly improved. This makes China more competitive in high-end manufacturing, services and other sectors. At the same time, with the improvement of scientific and technological innovation ability, China is gradually changing from demographic dividend to talent dividend.

5. The impact of the population policy adjustment

In recent years, China has made a series of adjustments to its population policy, including the full implementation of the two-child policy and the gradual liberalization of the three-child policy. The implementation of these policies has had a positive impact on the population transformation, and has helped to alleviate the pressure of population aging and optimize the population structure. However, the policy adjustment also brings some new challenges, such as the decline of fertility intention and the imbalance of sex ratio at birth.

6. Population changes are closely related to economic development

Chinese population changes are closely related to its economic development. On the one hand, the migration flow promotes the optimal allocation of labor market and urbanization; on the other hand, the aging population and demographic quality dividend have a profound impact on economic growth. Therefore, when formulating economic policy and population policy, we need to take full account of population changes in order to achieve sustainable economic development.

Vii. Population changes show regional differences

Chinese population changes show obvious differences in different regions. The southern and south-east coastal provinces attract more developed economy and more employment opportunities, while some economically underdeveloped provinces face population outflow. This trend of population mobility reflects the pattern of Chinese economy strong in the south and weak in the north, and also has different effects on the economic development of different regions.

VIII. The Impact of new urbanization on population transformation

New urbanization is one of the important strategies for Chinese future development, which has had an important impact on the population transformation. The new type of urbanization emphasizes putting people first and improving the quality and life of the urban population and towns. This helps to attract more people to the cities and promote urbanization, and also improve the living conditions of the migrants and their social integration.

To sum up, the current situation of population transformation in China is characterized by highly active population, continuous expansion of scale, intensified aging trend, emergence of quality dividend, significant impact of policy adjustment, close relationship with economic development and obvious regional differences. These characteristics have had a profound impact on economic growth, bringing both opportunities and challenges. Therefore, in the process of promoting economic growth, it is necessary to fully consider the factors of population transformation and formulate reasonable population policies and economic policies in order to realize the sustainable development of economy and society.

Chapter 2: Coping Strategies and Policy Suggestions

Section 1 Economic Growth Strategies for a Population Transformation

As a complex and profound social and economic phenomenon, the population transformation has had a profound impact on Chinese economic growth. In the face of profound demographic changes, we need to develop and implement a series of effective response strategies to alleviate the pressure of population transformation and promote sustained and healthy economic growth.

1. We will improve population policies and promote balanced population development

In view of the characteristics of Chinese population transformation, the population policy needs to adjust and optimize timely. On the one hand, we should continue to implement a positive birth policy and encourage school-age couples to have children, so as to improve the birth rate and alleviate the pressure of population aging. On the other hand, it is also necessary to pay attention to the optimization of the quality and structure of the population, improve the quality of the labor force, and promote the coordinated development of the population and the economy by improving the level of education and strengthening vocational training.

2. We will deepen economic restructuring and energize economic growth

The challenges posed by population transformation need to be addressed by deepening economic restructuring. This includes improving the market economy system, optimizing the allocation of resources and improving economic efficiency, strengthening innovation drive, promoting industrial upgrading and

transformation, and cultivating new economic growth points, deepening the reform of the household registration system, promoting the integration of urban and rural areas, releasing the potential of rural labor force and providing new impetus for economic growth.

3. We will strengthen the social security system to ensure peoples wellbeing

Population transformation has put forward higher requirements for the social security system. Therefore, it is necessary to further improve the social security system, expand the coverage, and improve the level of security. At the same time, a multi-level and diversified pension service system should also be established to meet the pension needs of the elderly population at different levels and with different needs. In addition, we should also pay attention to the vulnerable groups and intensify poverty alleviation efforts to ensure social equity and stability.

4. We will promote coordinated development among regions and improve the spatial distribution of the population

Population transformation also poses new challenges to the coordinated regional development. In order to realize the spatial balance between population and economy, it is necessary to promote the implementation of regional coordinated development strategy. On the one hand, the infrastructure construction and industrial development in the central and western regions should be strengthened to attract the flow of population to these regions; on the other hand, the population size and spatial distribution of big cities should be optimized to alleviate the problem of "big city disease".

5. Strengthen international cooperation and exchanges to jointly address population challenges

Population transformation is a global challenge that needs to be addressed by all countries. Therefore, China should strengthen cooperation and exchanges with other countries in the field of population, jointly study the law and influence of population transformation, and share experience and practices in dealing with population transformation. Through international cooperation, we can learn from the successful experience of other countries and improve Chinese ability and level to cope with population transformation.

To sum up, the economic growth strategy to deal with the population transformation is a complex and systematic project, which requires us to formulate comprehensive policies and measures from many aspects. By optimizing the population policy, deepening the reform of economic system, strengthen the construction of social security system, promote regional coordinated development, strengthen international cooperation and exchanges, promote scientific and technological innovation, strengthening the construction of cultural education and improve the implementation of the labor market system, we can effectively meet the challenge of population transformation, promote Chinese economy to achieve sustained and healthy growth.

Section 2 Relevant policy Suggestions and measures

In the face of multiple challenges brought by population transformation to Chinese economic growth, the government needs to adopt a series of targeted policies and measures to alleviate the negative impact of population change on economic growth and find new growth drivers. This section will put forward relevant policy suggestions and measures from several aspects.

1. We will improve the family planning policy and promote balanced population development

First, the birth policy should be further optimized to create a social environment conducive to the balanced development of population. On the basis of maintaining the stability of the current birth policy, the relevant supporting measures should be gradually adjusted and improved, such as improving the level of birth security, expanding the parenting holidays, and reducing the burden of family parenting, so as to encourage school-age couples to have children according to the policy. At the same time, strengthen publicity and education, improve the fertility willingness and fertility level of the whole society, and realize the coordinated development of population and economy, society, resources and environment.

2. Strengthen education and training to improve the quality of human resources

In the face of the decrease of labor force and the trend of aging, improving the quality of human resources has become the key. The government should increase the investment in education, optimize the allocation of educational resources, and improve the quality of education. At the same time, we will strengthen vocational education and skill training to improve workers skills and their competitiveness in employment. In addition, enterprises should also be encouraged to strengthen staff training, improve the comprehensive quality and innovation ability of employees, and provide strong human resources support for economic development.

3. We will deepen reform and opening up and stimulate new drivers of economic growth

Reform and opening-up is an important driving force for Chinese economic growth. Facing the challenge of population transformation, we should further deepen reform and opening up and unleash

market vitality and social creativity. To be specific, we can accelerate market-oriented reform, improve market mechanisms, optimize the business environment, and stimulate the vitality and innovation of market entities. At the same time, we will step up opening up, actively participate in global economic cooperation and competition, and expand the external space for economic growth.

4. We will implement a prudent monetary policy and maintain financial stability

A prudent monetary policy is an important means to maintain steady economic growth. In the process of meeting the challenge of population transformation, we should implement a prudent monetary policy to maintain the reasonable growth of the money supply and maintain the stability of the financial market. At the same time, we will strengthen financial supervision and risk prevention to ensure the healthy operation of the financial system.

To sum up, facing the challenges brought by the population transformation to Chinese economic growth, the government needs to take various policies and measures to deal with them. By optimizing the birth policy, strengthen education training, deepen the reform and opening up, promote innovation driven development, improve the social security system, strengthen the regional coordinated development, the implementation of proactive fiscal policy and prudent monetary policy, can effectively alleviate the negative impact of population change on economic growth, and promote Chinese economy to achieve sustainable and healthy development.

Chapter III Study Conclusion

This study is dedicated to the deep discussion of the impact of population transformation on Chinese economic growth, and draws a series of important conclusions through the combing of historical data, the construction of theoretical models and empirical analysis. Below is a summary of the main conclusions of this study.

1. Population transformation has remarkable characteristics and has a multidimensional impact on economic growth

This study first provides a systematic review of the characteristics of Chinese population transition. The results show that Chinese population structure has undergone significant changes in recent years, including the decline of population growth rate, the decrease of labor supply, the increasing trend of population aging and the adjustment of urban and rural population distribution. These changes have not only changed the potential growth drivers of Chinese economy, but also had a profound impact on the speed and quality of Chinese economic growth.

2. The impact of changes in labor supply on economic growth is complex

Labor force is one of the most important factors of production for economic growth. This study found that with the advancement of population transformation, Chinese labor supply gradually tightened, with a complex impact on economic growth. On the one hand, the decrease of labor supply leads to rising labor cost, which puts pressure on enterprise profitability; on the other hand, the change of labor market also promotes technological innovation and industrial upgrading, which promotes the optimization of economic structure.

3. The aging of the population faces both challenges and opportunities for economic growth

Population aging is one of the important features of population transition, and this study analyzes its impact on economic growth. The study found that the aging population has brought challenges to Chinese economic growth, such as the rising social dependency ratio and the increasing pressure on pension expenditure. But at the same time, the aging population has also brought opportunities such as the upgrading of consumption structure and the development of healthy industry, providing new impetus for economic growth.

4. The adjustment of urban and rural population distribution has a significant spatial effect on economic growth

With the advancement of urbanization process, the distribution of urban and rural population in China has changed significantly. This study found that the spatial effect of this change on economic growth was significant. On the one hand, urbanization brings population aggregation and scale effect, which promotes the rapid growth of urban economy; on the other hand, the transfer of rural population to the city also promotes the development of rural economy and the coordinated development of urban and rural economy.

Through this study, we are deeply aware of the profound impact of population transformation on Chinese economic growth. In the future, with the continuous promotion of population transformation and the continuous change of the economic development environment, we need to continue to pay attention to the relationship between population transformation and economic growth, and constantly adjust and improve the policies and measures to adapt to the new development situation and challenges.

At the same time, we also need to strengthen international cooperation and exchanges, draw lessons from the successful experience of other countries, and jointly promote global economic prosperity and development.

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RESEARCH ON THE RISK MANAGEMENT OF HUMAN CAPITAL INVESTMENT**Wang Xingguo**Student, Al-Farabi Kazakh National University
Kazakhstan, Almaty**Nietalina Gaukhar**Tutor, Al-Farabi Kazakh National University
Kazakhstan, Almaty**Abstract**

In the 21st century, knowledge and science and technology is the leading factor in the development of the world economy, rich knowledge and high-end science and technology become the main force to promote economic development and social progress, developed countries and some developing countries, focusing on the construction of domestic human capital at the same time, strengthen the introduction of foreign excellent human capital, to build and strengthen its human capital reserves, for the current and future sustainable development to lay a solid foundation. Under this time background, the research on human capital investment and its risk management is particularly important.

This paper starts from the characteristics and types of human capital, Classify the performance of human capital investment risk, Namely, economic risk, social risk, environmental risk and psychological risk; The source of risk for investing in human capital, Summarize as external risk factors and internal risk factors, among, External risk factors include social and environmental risks and industry environmental risks, Internal risk factors mainly include the introduction, training, allocation and management of human capital, For the society and the country, The benefits of human capital investment are reflected in the investment of a country and society in the material resources and knowledge of people of all ages, So as to achieve the promotion of the whole country, social competitiveness and long-term development. Finally, through the theoretical research and field research of human capital investment and its risk management, the management strategy of human capital investment risk is summarized.

Keywords: human capital human capital investment human capital risk risk management

1. Human capital

The culture of developing countries and European and American culture has great difference, in addition, the modernization of high-tech and information technology personnel, due to the poor living conditions and living standards, the cultural education career is relatively backward, therefore, as a whole, the human capital from stock to structure, is relatively backward, in this case, even if there are external input of many material capital, also lack of matching human capital for digestion, absorption and integration. Schultz once said, "compared with developed countries, less developed countries have fallen behind in the production and export of agricultural products, but we did not see, most of the change is that the agricultural scientists and technicians associated with the work of knowledge progress, knowledge progress in developed countries and less developed countries apply the difference of speed".

Human capital not only received attention in the academic circle, but also the practice of developed and developing countries after World War II proved the important role of human capital in economic development. Many cities in Western Europe and Japan were greatly destroyed by their material capital. However, in the half century after the end of World War II, Western Europe and Japan developed rapidly and became veritable developed countries. The reason lies in the fundamental differences in the capital stock and capital composition of the two types of countries. Western Europe and Japan, destroyed in the war more is the material capital, and its more high-tech literacy and cultural knowledge of talent, the human capital was not devastating, in addition, western Europe and Japan and other countries of the national quality has reached a certain level before the war, after the war is to improve the overall quality of the national, the human capital, once get sufficient material capital support, can drive the economic and social recovery. This is not the case in developing countries.

The global flow of human capital and the competition for outstanding talents in various countries have become the commanding heights of the technological and economic competition in the new era. From the perspective of the process and trend of world development, human capital will become the main factor affecting the competition between enterprises and even the country, and the promotion of human capital will become the main content and mode of the development of enterprises and even the country.

2. Human capital investment

In his book Human Capital, Gary Becker suggests that the investment used to increase human resources and influence future money and consumption is human capital investment. Gary Becker believes that human capital investment is "mainly human capital formed by education expenditure, health care expenditure, domestic mobility of labor, or expenditure for the entry of immigrants". That is to say, human capital investment is the investment of money, physical and time in human capital to improve the quality and quantity of human capital and finally increase labor output.

The object of human capital investment is human, and the purpose of investment is the accumulation and appreciation of human capital. Human capital investment is a kind of investment activity with the government, society, enterprises, families and individuals as the investment subject, with individual citizens as the investment object, and increasing human capital through a certain amount of education, training, health care and migration investment.

In addition to the natural physical quality, peoples physical strength and intelligence are formed by nutrition, health care, medical care and education, training, self-study, etc., which need to spend funds, that is, investment formation. Generally speaking, investors include the state, society, work units and individual families. The labor ability of all workers is obtained through the investment of these subjects. There are many types of human capital investment, mainly including the following types:

2.1. investment in education

Education investment is the investment of peoples learning ability, and all kinds of expenses and services spent for education, that is, the direct cost of education investment. The main body of education investment includes the state, society, enterprises, families and individuals. For the country, investment in education includes teachers salaries, investment in campus buildings, students tuition fees, books and transportation expenses. As for the daily living expenses of students, they are generally not included in the direct cost of education investment, because these expenses must be spent whether individuals receive education or not. The state or society by opening schools, Investment in education for all the population, Make people establish a correct world outlook, outlook on life and values, Master the advanced scientific and cultural knowledge and skills, Have some creative thinking, In making the overall improvement of self-quality, To enhance the overall quality of the country and even the comprehensive national strength, so, In todays rapid economic development and the multiplication of talents, To be in a dominant position, Can have certain capital to deal with facing difficulties, So this form of investment is important to the country, Is what every country must do and must take seriously, In a certain sense, The success or failure of educational investments, Direct relation to the future and destiny of a country, Is vital to the development of a country.

Different from the education investment of the state and the society, the enterprise education investment is mainly the non-skill education of the enterprise culture and professional ethics, which brings about the improvement of the intangible capital of the enterprise. About enlightenment of human capital investment, which plays a vital role in enterprise education investment, the new era under the background of new concept is the first contact, we cant the type of human capital investment only limited to these points, that is also people often think of several, but if put some far investment, we can see, ideas, customs, regional value orientation of groups, ethics, ideology and other informal system also plays an important role in economic growth, especially in the economic transformation.

In addition, families and individuals are the direct subjects of human capital investment. People from life began to give priority to with family of human capital investment subject investment, as investment object, in the process of learning also invested their time and energy, it is also a kind of cost investment, the cost of investment benefits in the short term is to see what effect, but in the long run, its income is far greater than the cost of investment. In this process, we not only learned the textbook knowledge and skills, more importantly, we learned the method of thinking about problems and the judgment of our own values, but also learned how to carry out self-psychological debugging.

From formal learning to set foot on their own jobs, for accept education individuals, if they continue to learn, will take up their leisure time or more realistic said he will give up their work time, as a result, their salary corresponding will reduce, but give up the income is not a loss, but education cost of

an indirect cost, is we continue to play their value of intangible capital accumulation, to increase the value of human capital.

2.2. Investment in health care

With the development of economy and the progress of human society, the country is also paying more and more attention to the improvement of public health system, public health is the science and practice of preventing disease, prolonging life span, and improving physical health and skills. That is, through a series of health care establishment to ensure that every member of the society can enjoy and maintain a healthy standard of living. The public health system is composed of several subsystems: regulation system, resource system, security system, and public health service and public management system. The investment in health care is directed directly at the physical health status of the workers. The country is constantly updating the health care system to benefit every citizen. From the practical point of view, health care investment is actually a productive investment that can bring the expected economic benefits to investors. In the broad sense, the national investment in health care is to improve the national quality, so that people can better invest in economic development. In the narrow sense, the investment of health care is also every citizen himself, when people have more energy into production and consumption, thus improving labor production efficiency. Medical and health care is a very important department of human capital production in the national economy, Vigorously develop medical and health care undertakings to improve peoples health, the stock of human capital increased rapidly, thus promoting a strong increase of the economy

Different from the national and social investment in human capital health care, enterprises should also emphasize the guarantee investment such as medical insurance and industrial injury insurance, as well as make the working environment more beneficial to health. More specifically, it is through the improvement of the physical quality of the workers, that is to say, the workers have more exuberant energy to work in their own posts, which in the workers productivity at the same time to create benefits for the enterprise, so as to increase income. No matter what you are engaged in, the first thing to ensure that "people" is the productivity factor. Only when the overall quality of employees is improved can the whole enterprise have profits. That is to say, strengthening the investment in health care is also to make employees have more energy to put into their work, so as to effectively improve labor productivity.

3. Human capital risk management

It is generally believed that the human capital investment risk of human capital includes three types, namely, the human capital investment risk of government, the enterprise human capital investment risk and the investment risk of individual type. The human capital investment with considerable risk, mainly because the main body of relative diversity, the uncertainty of investment object, long-term and the investment behavior of investment returns, social environment impact factors refers to the enterprise in the process of human capital investment, by the influence of social environment change and the risk. These environmental factors include policy changes, macroeconomic operation status, market demand change trend, industry technology update cycle, human capital supply and demand situation and other force majeure effects, etc.

3.1. Macroeconomic performance status

Macroeconomic operation status is a background of human capital investment, and human capital investment is a kind of economic activity, which is inevitably affected by the macro economy. The impact of macroeconomic conditions on enterprises can be divided into short-term and long-term aspects. Macroeconomic policies affect the changes of market parameters such as commodity prices, interest rates and taxation, so as to change the operating cost accounting and profit level of enterprises, and affect the operating efficiency of enterprises. The macroeconomic operation will have an impact on the operation and decision-making of each enterprise, thus changing the expected goal and behavior of its operation.

Due to the long income cycle of enterprise human capital investment, the change of macroeconomic operation status is easy to lead to the loss of human capital investment income. For example, corporate investment in human capital may suffer in a downturn. On the one hand, the macroeconomic situation affects the education investment of human capital, on the other hand, it affects the change of the job market of the labor force. During the good macroeconomic situation, the human capital has high expectations for work, and the national investment in education will also increase the corresponding proportion. Enterprises will also have more investment returns in the period of good macroeconomic situation, so the macroeconomic situation is the macro factor that affects the investment risk of human capital at the level of social environment.

3.2. Policy changes

The change of policy environment will cause loss to human capital investment and produce unexpected risks. On the one hand, the human capital investment decision of an enterprise must comply with the national (local) laws and regulations and policies; on the other hand, the national industrial policy, fiscal policy, investment policy, income policy, consumption policy and price policy will have an impact on the efficiency of the enterprise. Monetary policy and fiscal policy are the two most important macroeconomic policies. They promote and restrict each other, and their impact on the banking industry is particularly obvious. The change of macro-policy factors will have a great impact on the input-output ratio of the human capital investment decisions of banks.

3.3. Human capital market demand

The influence demand of human capital investment is mainly the change demand of market products and the change demand of human capital market. The change of the former will lead to the change of the latter, but on the whole, both may cause losses for human capital investment. The change of market demand for products is the diversification of consumers demand for products. At the same time, the change of market demand also promotes the refinement of the division of labor and the formation of the diversification of occupational types. There are many replaceable jobs in the human capital market. The risk of human capital loss stems from the attributes of human capital itself. Human capital has the characteristics of pursuing the maximization of its own interests. In the process of flow, it is willing to work in units with higher income, better environment, more development opportunities and can fully realize its own value. When the original enterprise cannot meet the needs of the investment objects, there will be a brain drain. On the one hand, the investment cost of human capital investment of the enterprise cannot be recovered, and on the other hand, the replacement cost caused by filling the job vacancy is increased. At the same time, the talents flow into the competitors enterprises, which improves the competitiveness of the other side and brings greater competitive pressure to the enterprises. Because the individual talents of the employees are diverse, these factors will create two different forces: one is that the market demand changes will produce a thrust, manpower More and better opportunities in the capital market will make existing employees dissatisfied and make exit decisions; the other is the pull of market demand, and new opportunities will attract employees to new jobs

The supply situation of human capital includes the quantity and supply structure of human resource supply in a certain period of time. From the situation of our country, the control of the supply of education suppresses the enthusiasm of social running schools, and the lack of government financial resources restricts its investment in education, resulting in the shortage of the total supply of human capital in China. The planned allocation of human capital makes it difficult for the supply of education to adapt to the demand for human capital in economic development, which causes the serious shortage of human capital and a large amount of waste in China. Taking commercial banks as an example, the quality of human capital is positively correlated with the efficiency of banks. The higher the education level of bank employees is, the higher the quality of human capital is, and the higher the efficiency of commercial banks is.

3.4. Industry environmental factors

Industry environment factors mainly refer to the factors of the industry where the enterprise is located, the nature of the enterprise, the status and the reputation of the enterprise in the industry, and the advanced end industry can attract excellent talents. These high-tech industries have high requirements for talents, and give higher salaries and good welfare benefits. The welfare treatment of state-owned enterprises is also better than that of private enterprises, so there are differences in the intensity and level of the risk of human capital investment. The impact of the choice and positioning of a career and industry on life opportunities has also changed with time.

Industry environment for personal career vision has a significant impact, but in China due to the system, national policy, state-owned enterprises and high-tech industry more attractive for employees, at the same time, in the state-owned enterprises and high-tech industry for education level, attaches great importance to the cultivation of enterprise culture, so the enterprise human capital risk is relatively small. Enterprises with higher industry status will also have higher return in terms of human capital investment and income.

3.5. Effect of force majeure

Force majeure in the social environment mainly includes the technology renewal cycle of the industry and the substitution of technological products for human capital. The development of modern technology will devalue the human capital investment of enterprises and cause huge losses. The influencing factors of human capital investment risk are analyzed from the individual level, organization level and social environment level respectively. In the daily operation process of an enterprise, the influencing

factors of the three levels jointly act on the human capital investment, and the influence on the risk of human capital investment is the effect of the resultant force.

From these factors, taking corresponding measures can effectively reduce the risk of human capital investment. At the organizational level, the enterprise can improve the corresponding system and norms to motivate employees, adopt scientific and reasonable work arrangement, strengthen the construction of enterprise culture, enhance the sense of belonging of employees, so as to reduce risks; at the individual level, according to different group characteristics, to promote the enterprise, to contribute to the enterprise, promote the common growth of employees and the enterprise and create a win-win situation.

4. Conclusion:

This paper studies the existing human capital investment status. Compared with material capital, human capital has its particularity. Therefore, the study of the benefits and risks of human capital investment cannot follow the inherent research theory of ordinary capital. From the characteristics of human capital, this study analyzes the characteristics and types of human capital investment, the performance and the source of human capital investment risk, analyzes the factors of the human capital investment risk, on this basis, the relevant research results of risk management theory, puts forward the risk management strategy of human capital investment. The state and society generally control the production of human capital quantity, physiological quality, cultural and educational quality, scientific and technological quality, as well as the age and quality structure of human capital. It can be said that the situation of national and social human capital investment is the premise of human capital investment choice by individuals, families and enterprises. Government behavior is the embodiment of national behavior, and the governments decision on human capital investment must reflect the overall interests of the country. At the same time, the quality of higher education has also attracted attention. In recent years, the difficulty of finding employment in universities shows that the output of higher education has not achieved the expected effect. The government is forced to make the capital investment, structural adjustment and content upgrading of human capital investmentthe eyebrows and eyelashes. Between government behavior and individual behavior, society, as a running-in space, should play the role of supplementing insufficient government behavior and assisting in improving individual behavior. In terms of human capital investment, human capital investment with he society as the main body is not developed. In the absence of the pertinence of the government human capital investment behavior and the lack of information of the individual human capital investment behavior, the social human capital investment should be brought into full play

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Jurisprudence

CONCEPT, THEORIES AND LEGAL BASIS OF THE SUCCESSION OF STATES

Qabil Gafarov

associate professor, Odlar Yurdu University, Baku, Azerbaijan
Vice-Rector for "Organization of Teaching and New Learning Technologies"

Mayil Orucov

Honorary Professor of SMBS (Swiss Montreux Business School),
Odlar Yurdu University, Baku, Azerbaijan
ORCID: 0009-0001-8177-3851

Abstract

The article examines the concept, theories and legal foundations of the succession of states. The sphere of international legal regulation of the institution of succession of states and the areas to which it does not apply are indicated. It is noted that the practice in this area is contradictory and diverse, and at the same time depends on the agreements of the interested parties and the balance of power. Therefore, it has been impossible to formulate a general rule in the legal succession of states. In particular, the concept of continuity prevails in relation to international treaties on citizenship, including human rights. Nevertheless, these treaties have formed a significant path in resolving the issues of succession of states, and a number of important provisions reflecting generally accepted practice have been established. According to the basic principle codified by these treaties, issues of succession can be resolved by agreements between the interested states in accordance with specific cases. In the event that the relevant norms do not provide for adequate regulation, succession should be regulated by the norms of general international law.

Keywords: *international relations, international law, legal succession, human rights, succession of states, international legal norms*

1. Introduction

One of the issues that constantly changes in international relations is the fact of the merger of one state with another, the separation of part of a state from the previous one, or the division of this state into several independent states. Such changes significantly affect the world legal system, international law, which is the basis for regulating international relations. Examples of changes that affect the geopolitical situation as a whole are the incorporation of the former German Democratic Republic into the Federal Republic of Germany in 1990; the secession of Latvia, Lithuania and Estonia from the USSR in 1991; the cessation of the existence of the USSR as a state and the creation of independent states in the Caucasus, including the Republic of Azerbaijan, Georgia and Armenia; the creation of the independent states of Bosnia and Herzegovina, Macedonia, Slovenia, Croatia, as well as Serbia and Montenegro, united in the Republic of Yugoslavia, in 1992; The creation of the Czech Republic and Slovakia in place of Czechoslovakia in 1993 can be cited [3].

The events of mergers, splits, and separation of parts of states related to legal succession and the institution of international legal recognition also occurred in previous years, for example, starting from the end of World War II: the secession of Pakistan from India in 1947, and Bangladesh from Pakistan in 1971; the creation of the United Arab Republic of Egypt and Syria in 1958; the return of Syria to the status of an independent state in 1961; the separation of Singapore from Malaysia in 1965; the unification of Yemen and Democratic Yemen into a single state in 1990[3, p.218], accompanied by political, socio-economic events, also led to changes in the geopolitical situation. After World War I, the collapse of several large empires, for example, Russia, the establishment of Georgia, the Azerbaijan Democratic Republic and Armenia in the Caucasus in 1918, and the occupation of these states by the newly formed Soviet Russia in 1920 also led to serious changes in international relations [1].

The disappearance or, conversely, the emergence of states is associated with political, social and other such facts. At the same time, it raises new problems, such as the recognition of succession states [6]. In such cases, the role of international law is to determine the significance of the changes that have occurred from a legal point of view and to associate the relevant legal consequences with them. These

processes find their expression in the institution of succession of states, in the theories existing in this area, and in normative regulation.

2. Discussion

The concept, conditions of formation and theories of succession in international law

Succession of states has also created a certain concept as an international legal institution. Since the normative regulation regarding this institution began to be established in the late 70s and early 80s of the 20th century, a doctrinal concept was first adopted. In international law, legal succession means the transfer of rights and obligations from one state to another as a result of the replacement of one state with another in the responsibility for international relations of any territory [14]. That is, a new subject of international legal relations replaces the previous one. Sometimes the expression "the transfer of rights and obligations of a non-existent subject to a newly emerging subject" [13] is also mentioned in definitions. At the same time, it is emphasized that legal succession with the creation of a new one in place of the old is not enough for legal succession. For this, the continuity between the new and the predecessor, which is a very important condition, must be violated. Succession does not arise in the event of a change of governments or regimes, nor does it depend on whether this change is unconstitutional or not. From the point of view of international law, a state is considered to be a combination of three elements - population, power and territory. The change of power and population does not create any consequences for the succession of rights. Only the change of territory creates the problem of succession of rights. The moment of the emergence of succession of rights and the object of succession of rights are of great importance for the succession of rights. The concept of "the moment of the emergence of succession of rights" indicates the date when the successor state replaces the previous state in terms of bearing rights and obligations. The object of succession of rights is the territory in respect of which the state responsible for international relations has changed.

Thus, international succession of rights is the periodic replacement of the rights and obligations of the predecessor state in terms of international relations with the rights and obligations of the newly emerging state in a certain territory.

In the implementation of legal succession, regardless of the number of states participating in this process, two parties are distinguished: the predecessor state, which the new bearer of responsibility replaces in whole or in part of the territory, and the successor state, which is the new bearer of this responsibility. Legal succession involves the transfer of rights and obligations from one state to another. When the predecessor state ceases to exist, the termination of its rights and obligations is observed with the emergence of the rights and obligations of the newly formed state. When the predecessor state remains, its rights and obligations are preserved, and the newly formed state becomes the owner of rights and obligations without any transition. The scope of legal succession is determined depending on the will of the predecessor state and the successor state [3].

Based on the numerous cases and scope of legal succession, various theories in international law have been developed:

- tabula rasa ("clean slate") theory;
- theory of universal legal succession;
- continuity theory;
- negative theory, etc. have been put forward.

According to the tabula rasa theory, as a rule, a new state formed by a national liberation movement to get rid of colonial dependence has no connection with the international obligations of the predecessor state. International relations are rebuilt in all areas. The theory of universal legal succession reflects the transfer of all rights and obligations of the predecessor state to the successor state. In this case (provided that territorial integrity, population, political power are maintained), the predecessor state is fully established in the successor state. In most cases, this situation is characteristic of superpowers. According to this theory, succession is envisaged only for international treaties. Partnership is declared for all international treaties. In addition, rights and obligations under treaties are transferred from the predecessor state to the successor state. Part of the practical realization of this theory is the definition of the Russian Federation as the "successor" of the USSR in all rights and obligations. The theory of continuity is close to the theory of universal legal succession. However, there are controversial views on continuity itself. In the theory of international law, different approaches to the interrelation of continuity and legal succession prevail. Professor B. Chernichenko rightly believes that continuity and legal succession are different concepts [17]. According to Professor J. Crawford, there is a serious difference between the legal succession of a state and the continuity of a state: in the first case, a new state replaces the state, and in the second case, despite the change of power, territory, and population,

the previous state continues to exist. In some cases, during the collapse and unification of a state, difficulties arise in determining the status of states when the predecessor state continues to exist alongside newly formed states. Confirmation of continuity in some cases also arises from the recognition of other states. For example, Austria and Mexico recognize the Russian Federation as a successor to the USSR, not as a successor, but as a new state [22].

The negative theory reflects the replacement of one state by another without preserving international treaties [19, pp. 525-558]. In a certain sense, it is close to the tabula rasa theory. However, in this case, only the attitude to international treaties is the subject of discussion. These theories were associated with the relatively late codification of the institution of legal succession of the state in international law, as well as the incomplete codification of this institution.

International legal norms on the succession of states

As an institution of international law, the legal succession of states is regulated by international law in various areas - international treaties of states, state property, state archives, state debts, state territory, state borders, in relation to international organizations, as well as membership in bodies [12; 20]. Practice in the field of legal succession is contradictory and different, but at the same time it depends on the agreements of the interested parties and the balance of power, so it is difficult to formulate a general rule here [18, p. 59]. International legal norms related to the legal succession of states are mainly customary law in nature. International experience and precedents, decisions of international bodies, and in some cases, national legal acts of the state also play an important role. It is no coincidence that codification in this area has not achieved any particular success. The Vienna Convention on Succession of States in Respect of Treaties of 22 August 1978 (signed by 23 States, ratified by 15 States, in force since 1996) [32] and the Vienna Convention on Succession of States in Respect of State Property, Archives and Debts of 8 April 1983 [27] were adopted. The failure of the latter Convention to enter into force, the failure to address a number of issues (for example, their resolution in the event of serious social changes), and the lack of consistency with practice indicate that codification was not successful. Despite the aforementioned problem, the conventions have also provided a certain progressive development. For example, Article 2, paragraph 1(b) of both conventions provides the concept of "legal succession of States". The conventions proceed not from general practice but from the "principle of specific legal succession" [16, p. 284]. The 1978 Convention is based on the principle of succession of treaty obligations [23, p.6, 74-96]. An exception to this is the colonial treaties of the newly independent states. The treaty obligations of these countries are based on the tabula rasa principle. Special rules are applied here as well. Article 17 of the 1978 Convention opens up new opportunities for newly independent states to join multilateral treaties on the basis of the free choice doctrine. The legal succession of states does not affect border treaties, border regimes, as well as treaties on the right of transit [16, p.284]. In particular, the concept of continuity of human rights treaties prevails.

The main feature of international treaties on human rights is that these treaties are not limited to a specific territory, but are aimed at protecting the rights of the population and the individuals who form that population. International treaties on personal and political rights also affect the legal succession of states. According to international law (the 1978 Convention on the Succession of States in Respect of Treaties (art. 34.2)), a newly formed state enters international relations with the principle of a "clean slate" (tabula rasa). However, as we have already stated, there are certain categories of treaties, the obligations they establish are automatically transferred to the newly formed states [9, p. 50]. If treaties determining the territorial regime are transferred to the successor state together with the territory by being bound to the territory, then treaties on human rights are transferred to the successor state by being bound to the population living in the relevant territory, and in this case, regardless of whose jurisdiction the population is transferred to, they cannot be deprived of the international legal protection of their rights and freedoms recognized by international law [8, p. 39-40]. Although this issue is not unambiguously accepted in the doctrine of international law and in the practice of states, it is finding more grounds for itself with the increase in interest in human rights and their protection. Based on the contradictory experience of states, many authors note that international treaties on human rights have a superior position in the issue of legal succession. The positive position of international bodies and judicial institutions in this area, for example, in the former Yugoslavia, the Soviet Union, Czechoslovakia, Hong Kong, etc. countries, is cited as the basis for the continuity of international treaties on human rights [25, p.493; 28, p.84; 29, p.357; 26, p.190-191]. As early as 1992, the Human Rights Committee had appealed to the newly formed states on the territory of the former Yugoslavia - Croatia, Bosnia-Herzegovina and the Federal Republic of Yugoslavia (consisting of Serbia and Montenegro) - to submit their reports on the level of observance of civil and political rights. The Human Rights Committee,

referring to the obligations of the former Yugoslavia under the International Covenant on Civil and Political Rights, stated that the successor States were not likely to give the impression that they would not apply international human rights treaties and that the population of the territory of the former Yugoslavia would not be able to enjoy the benefits of international human rights treaties. no basis [21, p.3]. Subsequently, the relevant states, expressing a positive attitude to the Committee's appeal, also agreed to an investigation into the mass violation of human rights that had been carried out. A similar position was expressed by the Committee in relation to the post-Soviet states. The Committee stated that these states were bound by the provisions of the Covenant from the moment they gained independence [31, p.49]. The Republic of Azerbaijan, one of the post-Soviet states, acceded to the Covenant on 21 July 1992 and, when submitting its first report to the Committee in 1994, stated that it was ready to bear responsibility for all events that occurred on its territory after gaining independence until the moment of accession to the Covenant. One of the concerns raised in the final summary of the initial report of the Republic of Azerbaijan was the existence of conflicts between national legislation and the requirements of the Covenant [2]. The efforts of the Republic of Azerbaijan to bring its legislation into line with its international obligations were also assessed by the Committee.

On the one hand, the Republic of Azerbaijan has accepted the specific features of human rights treaties, and on the other hand, it has shown that this specificity has not yet become a common practice (custom). As is known, the Azerbaijan Soviet Socialist Republic was also a party to the International Covenant on Civil and Political Rights of the USSR, of which it was a founder. Article 4 of the Act on State Independence of the Republic of Azerbaijan stated that international treaties to which the USSR was a party may be applied in the Republic of Azerbaijan, unless they contradict its independence and sovereignty [15, p. 87]. However, Professor L.G. Huseynov notes that the act of assuming obligations for the events that occurred on the territory of the country after independence until the Republic of Azerbaijan joined the Covenant can be assessed as a tacit recognition of the obligations under the Covenant rather than a "succession" [8, p. 47]. When discussing the continuity of international treaties on human rights, we should note that, no matter how different positions there are in this area, development trends are moving towards the principle of respecting human rights. State sovereignty is being accepted in relation to the principle of respecting human rights. As stated in Article 12 of the Constitution of the Republic of Azerbaijan, "Ensuring human and civil rights and freedoms, and a decent standard of living for citizens of the Republic of Azerbaijan is the supreme goal of the state" (I) indicates the purpose of state sovereignty [4, pp. 71-72; 7, p. 18]. Part II of that article, "Implementation of human and civil rights and freedoms listed in the Constitution in accordance with international treaties to which the Republic of Azerbaijan is a party" also indicates the formal political course of the Republic of Azerbaijan in relation to international obligations on human rights. That is, if we are talking about "inheritance" here, inheritance is possible only in the social sense. It should be noted, in agreement with Professor L. Huseynov, that the rights and obligations of the occupied (Soviet Azerbaijan) territory in terms of international relations were completely different from the rights and obligations of the newly formed (Azerbaijani Republic) territory. Therefore, inheritance should be accepted as a condition here.

The recognition of international treaties on civil and political rights as a norm of customary law is also an accepted fact. The recognition of the principle of respect for human rights as the most important of the general principles of international law [24] and the acceptance of the provision of human rights and fundamental freedoms as the supreme goal of the state are also characteristic of the legal systems of other states. Prof. L. Huseynov notes that currently we are witnessing the emergence of a new international customary law norm that gives specific continuity (continuity - author) to international treaties on human rights and takes into account their special nature [8, p.39]. The transfer of international treaty obligations on human rights directly to the newly formed "successor" state, not on the basis of social succession, that is, on the basis of mutual agreement, is a new development trend of international law.

The continuity of international treaties on human rights is surpassing the "tabula rasa". The disintegration, merger, and re-establishment of states should not undermine the continuity of treaties on human rights, their universality and the concept of the beginning of natural law. Newly formed states have undertaken to respect human rights, at least in universal international organizations, for example, within the framework of the UN, by adhering to the Charter [30, p.193]. The main purposes of the UN are to maintain international peace and security, to develop friendly relations among nations, guided by the principles of equal rights and self-determination of peoples, and to achieve international cooperation in solving problems of an economic, social, cultural and humanitarian nature (Article 1.1; 1.2) 1. According to Article 3, the Organization imposes on all members the obligation to promote and develop

human rights and fundamental freedoms for all, regardless of sex, language or religion (course - author) [10, p.458; 11, p.99]. This article is already a customary norm. It is in effect regardless of how states are established. That is, social or human succession constitutes the rule of general international law.

One of the pressing issues related to the succession of states is the regulation of citizenship. The International Law Commission has been working on this issue since 1993. The Draft Articles "On the Citizenship of Individuals in Relation to the Succession of States" submitted to the UN General Assembly in 1999 reflect the provisions on the regulation of citizenship in cases of dissolution, merger, and transfer of part of their territory. The regulation of citizenship during the succession of states includes: the right of everyone to citizenship; the exception of statelessness; respect for freedom of will in choosing citizenship; family unity, etc. The obligation to observe the principles has been established.

The 1997 European Convention on Nationality also reflects the requirement to observe fundamental rights in matters of acquisition and loss of citizenship by succession of States. It is noted that when making a decision on granting and retaining citizenship during succession, each State must take into account: the existence of effective ties of a person with the relevant State; the person's permanent residence during succession; the will of the person, etc. The innovation in the Convention from an international legal perspective is related to non-citizens. Citizens of the predecessor state who permanently reside in the territory transferred to the successor state, even if they do not accept the new citizenship, acquire socio-economic rights equal to citizens of the successor state by remaining in the territory of the successor state.

3. Conclusion

The succession of states, as an institution of international law, provides international legal regulation of the relations of states with international treaties, state property, state archives, state debts, state territory, and international organizations. However, the practice in this area is contradictory and different, and at the same time depends on the agreements of the interested parties and the balance of power. Therefore, it has been impossible to formulate a general rule in the legal succession of states. In particular, the concept of continuity prevails in relation to international treaties on citizenship, including human rights. Nevertheless, these treaties have formed a significant path in resolving the issues of succession of states, and a number of important provisions reflecting generally accepted practice have been established. According to the basic principle codified by these treaties, issues of succession can be resolved by agreements between the interested states in accordance with specific cases. In the event that the relevant norms do not provide for adequate regulation, the succession should be regulated by the norms of general international law. If any territory has been subjected to aggression or occupation, the problem of succession will not arise.

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Medical sciences

THE USE OF MINIMALLY INVASIVE TREATMENT METHODS FOR INTERNAL DISORDERS OF THE TEMPOROMANDIBULAR JOINTS

Kostiuk Tamara

Postgraduate student of Department of Oral and Maxillofacial surgery

Lytovchenko Nataliia

PhD, Associate Professor of the Department of Surgical Dentistry and Maxillofacial Surgery

Bogomolets National Medical University, Kyiv, Ukraine

Topicality. Internal disorders of the temporomandibular joints (TMJs) is a general term that unites diseases in which there is a displacement of the articular disc, its deformation, stretching and destruction of intra-articular ligaments, defects and deformations of the articular disc, degenerative changes of the articular surfaces, inflammation of the synovial shells, as well as other manifestations of pathological changes in the capsule apparatus. The prevalence of internal disorders of the temporomandibular joint (TMJ) is steadily increasing, especially in people aged 18-45, which reaches 95-98% among all visits to dentists.

The **aim** of the study is to analyze and evaluate the existing data on the effectiveness of using minimally invasive treatment methods in patients with internal disorders of the temporomandibular joints based on a detailed analysis of domestic and foreign scientific literary sources in recent years, that identify the advantages and limitations of choosing complex treatment and substantiate the decision to choose minimally invasive techniques for patients with internal disorders of the TMJ.

Materials and methods. When using the scientometric databases of medical research "PubMed" and "Google Scholar", a search was conducted using the keywords "temporomandibular joint", "disorders", "minimally invasive", "arthrocentesis", "arthroscopy". As a result, 26 foreign and domestic scientific sources for the period 2014–2024 were included and analyzed in the literature review.

Results and conclusions. Minimally invasive surgery of the temporomandibular joints is mainly represented by three methods of treatment, to which we include arthroscopy, arthrocentesis and injection of drugs into the joint. The use of minimally invasive methods for internal disorders of the temporomandibular joints is a priority method of surgical intervention, which is currently actively used in everyday medical practice.

At the same time, it is impossible to give a proper objective assessment of the effectiveness of a purely minimally invasive surgical approach in comparison with conservative generally accepted treatment schemes due to inferior randomized control studies and comparative clinical trials. The absence of the aforementioned evidentiary factors for the application of clinical recommendations regarding their disadvantages or advantages only emphasizes the need for a detailed scientific study of a multidisciplinary treatment approach using minimally invasive techniques to improve the individualized treatment of patients with internal disorders of the TMJ.

Keywords: temporomandibular joints (TMJ), minimally invasive interventions, arthrocentesis, arthroscopy, injection therapy, surgical dentistry, articular disc.

Philological sciences

THE PROBLEM OF WOMEN'S FREEDOM IN THE CREATIVE WORK OF M.A. SABIR

Rzayeva Garanfil Zeygam

Senior Lecturer,

Agjabadi Branch of Azerbaijan State Pedagogical University, Azerbaijan

Abstract

Human society is formed and lives in the area of tension between two poles - the psychology, way of thinking, and problems faced by women. Naturally, the gender issue, which has become a global problem worrying humanity in all socio-political epochs, has been highlighted in one way or another in accordance with the spirit of the times. In both Western and Eastern socio-artistic thought, images of women were studied within the framework of the concept of man in fiction and solved as an important social problem.

At the beginning of the 20th century, their isolation from public and political life due to illiteracy and fanatical traditions created a number of difficulties for women's personal lives. The intellectual elite of Azerbaijan tried to educate the people, explain their rights and duties, and put forward the idea that "until women are free as individuals, the problems of the people will remain unsolvable!" H. Zardabi, A. Aghayev, M. Shahtakhtli, J. Mammadogluzadeh, O. F. Nemanzadeh, A. Nazmi, M. A. Sabir, F. Kocharli, M. S. Ordubadi, J. Jabbarli, M. A. Rasulzadeh and others wrote more on this topic. They were not afraid of the attacks of fanatical religious people, but they were able to draw attention to women's problems, criticized the forced marriage of girls, the treatment of men as slaves, and brought to attention the need to provide women with an equal education with men.

Each of the artists mentioned above had a unique approach to the issue and artistic generalization. Of them, Mirza Alakbar Sabir's work is most striking for its originality in relation to women's issues.

The article examines the work of Mirza Alakbar Sabir from the perspective of women's freedom, and his works, which reflect the motifs of the struggle against women's rights, which has become an important problem of the society in which he was a contemporary, have become the object of analysis.

Keywords: *Mirza Alakbar Sabir, science, education, women's freedom, artistic tendency, Azerbaijani woman, enlightenment, etc.*

Mirza Alakbar Sabir Tahirzadeh, one of the prominent figures of Azerbaijani literature of the new era, is a great people's poet of Azerbaijan, a patriotic thinker and public figure. He has matured and perfected the pioneering traditions of national literature, classics such as Khagani, Nizami, Fuzuli, Vagif, Akhundov, Seyid Azim, and centuries-old Eastern poetry. Sabir's book of poems known as "Hophopname" is considered a wonderful example of realistic literature and a great monument of national artistic thought. Sabir is the owner of the glory that is unique to a poet among the Turkic-speaking peoples. As one of the leaders of the "Molla Nasreddin" literary school, he, together with Azerbaijan, had a strong influence on the literary development of many countries of the East, creating a poetry school distinguished by its originality and great intellectual and aesthetic power.

In his decree dated June 1, 2010, the President of the Republic of Azerbaijan Ilham Aliyev said in connection with the celebration of the 150th anniversary of the birth of Mirza Alakbar Sabir: "Mirza Alakbar Sabir, while worthily keeping alive the bright traditions of our centuries-old poetry, has gained fame as a master of words who has raised our literature to a qualitatively new level and enriched it further in terms of social ideology. The main theme of the works created with great talent by the thinker poet, one of the leading figures of the literary movement formed around the magazine "Molla Nasreddin", was a call for spiritual purity, cultural advancement and enlightenment.

Sabir came to our literature with such a deep-rooted foundation that we see the yeast of the literary sources he benefited from in every example of art he created. Sabir, who began his creative work

in the second half of the 19th century, was able to refine his poetic convictions at the beginning of the 20th century.

The changes that took place in social life at the beginning of the century also affected science, culture and literature. The First Russian Revolution of 1905 laid the foundation for the national awakening not only of the Russian people, but also of the peoples of Transcaucasia. The publication of the magazine "Molla Nasreddin", our democratic press organ, and its transformation into a mirror of people's life, gave impetus to the creativity of artists with a revolutionary spirit.

The democratic literary front, which received its yeast from the realism of M. F. Akhundzade, gathered around itself the open-minded, enlightened intellectuals, poets and writers of the time. Among them, undoubtedly, was Mirza Alakbar Sabir. Sabir was a poet even before the revolution. However, it was the poems and immortal works he wrote in 1906-1911 that made him known as a true artist.

"The exposure of tsarism and the exploitative system, the criticism of religious superstition and ignorance, fanaticism and fatalism, the slavery of women, the education and upbringing of the younger generation, the struggle for the mother tongue, the national press and realistic literature, the problems of socio-cultural progress also run through the poet's creativity with a red line." (1, 7)

Sabir, who felt the demands of the changing century, took the themes of his works from real life and tried to create works that caught the pulse of the time. He knew his duty as a poet well and wrote:

*I am a poet, because this is my duty, to write poetry,
I will make the beautiful things I see, explain them.
I will make the day bright, the day white, the night dark,
I will make the bad bad, the crooked crooked, the straight smooth (2, 36).*

There is no area of life and no urgent issue of the time that would bypass Sabir's pen. The hard life of the working people, the ruthless exploitation of workers and peasants, cultural backwardness, religious fanaticism, vulgarity, ignorance, women's rights, etc. issues always made the great poet think and became the leitmotif of his literary struggle.

We had already encountered the germs of the struggle against women's rights in the works of the enlightened masters of our 19th century literature. The fact that Saadat Khanum ("Rashid Bey and Saadat Khanum") defied tradition and ran away with the young man she loved was an unprecedented event in the 19th century Azerbaijani environment. In addition to being a progressive event, the emergence of such a work of art in the Eastern world, where women were bought and sold as slaves, it became a source of inspiration and ideas for artists who came after her.

Mirza Alakbar Sabir also fought against violence against women and women's rights, which were painful aspects of Azerbaijani society at the end of the 19th and beginning of the 20th centuries, and was a supporter of women's participation in public life and participation in society. Sabir saw the difficult living conditions of Azerbaijani women and felt sorry for them. The poet, who understood the benefits of girls' gaining knowledge and education, rightly shamed those who opposed this idea with his own words in the poem "O heaven, the manifestation of oppression" and ridiculed their ideas about women. In this poem, told from the lips of those who consider girls' going to school a disgrace and an "insult" to Islam, the factors that determine the miserable life of Azerbaijani women, the clergy who prepare the ground for their unhappy future, and the environment that makes it happen become the target of criticism and the object of the great satirist's deadly laughter.

The affirmative pathos of Sabir's satire reflects the growing power of those who embark on the path of irreversible struggle for enlightenment compared to the forces opposing the enlightenment of society, their influence on all spheres of life, and the possibilities of changing life, lifestyle, life, and the system of outlook on life. Here, the increasing penetration of the enlightenment movement into national life becomes the subject of artistic analysis.

In the satire "O heaven, the light of oppression...", the content of the influence of the "school-nisvan" on social life, reflected in the monologue of the satirical type, proves that the image of the school in the public consciousness is changing. It is felt that in the national environment, the number of those who are not only sympathetic to the opening of new-type schools, but also of "schools-nisvans" and those who give impetus to this work is increasing day by day. It is impossible to prevent the progressive idea bearers from advancing the school movement and their intentions to expand the school network every day; the socio-cultural movement of the time is breaking the resistance of conservative forces: "... It is necessary that in the Islamic world, in every country, in every city, dinars and dirams be scattered, schools-nisvans be opened, girls should be ready for school, be skilled in science, be excellent in virtue, wear

dresses from head to toe, go to school ten by ten, learn dialects-bid'ahs, read and learn wisdom by nahw, learn medicine by studying, learn the language of writing, learn the habit of writing, be modest in a dog, be chaste in a bath... oh my God!" The transformation of those fighting for a new type of school, which robs the satirical type of sleep, frightens and worries it, into a social force, is the determination to mobilize social thought into this movement.

The poet tries to attack the worldview of those who see a woman's duty only in giving birth to children and sweeping the house:

"A girl needs to know: that is, housework, sewing clothes, washing old clothes, combing wool, mending clothes, sweeping the floor, blowing out bowls and pans, making meatballs, stuffed cabbage, mat halva, meat bozbashi, or bean stew, and a dakhi tandir lavash. If she doesn't know these things, she won't be blamed. However, the most necessary thing for a girl is to know one, two, or three things. If she knows them, she will be enough to obey: one is that the bride should be able to tell her father-in-law and mother-in-law that no one dares to say a word to her, and the other is that she should be able to tell her husband and her husband-in-law that she is the owner of the house.

The issue of young girls being married off to old men, which had almost become the scourge of the century, infuriated Sabir even more, and he sharply lashed out at the society that treated women as objects:

*Wow, this is not human,
This is not a way of conforming to a shape,
If you love God, this is not a husband,
He is a young man, don't let him go,
He is a bad man, don't let him go.*

*That day, when you got engaged, I was ashamed,
You said he was a boy, I believed him,
A husband would be like this, now I am his blood,
He is a wolf, a hog, don't let him go,
He is a bad man, don't let him go! (2, 182)*

M.A. Sabir's creativity is as human as it is national. By explaining the rights of his compatriots who were poor, excluded from school, plunged into the whirlpool of ignorance, and deprived of their rights, the poet first served the independence of the Azerbaijani people to which he belonged, and then of other peoples with the same fate. His name deserves to be listed in the same row as the outstanding artists in world literature who fought for human rights and opposed slavery. Mirza Alakbar Sabir's satire "What would you do with people with a heart of stone, O God", published in the magazine "Molla Nasreddin" on January 6, 1908, deeply analyzes the fate of humanity in a broad sense. Here, the poet expressed his support for the oppressed, whose tears were like a sea, and his opposition to oppressors and oppression and injustice in general, with great civic courage:

*Who would not remain honest and pure in a time,
I don't know what would you do with such times, O God?!*

*The tears of the oppressed will become a sea,
What would you do with the seas and oceans, oh my God?!*

*The good of the garden and the crops will be seen by the gentlemen,
What would you do with the farmers to plant the seeds, oh my God?!*

*Ignorance will rule in the whole world, –
What would you do with the wisdom on your tongue, oh my God?! (2, 145)*

The questions raised in the satire sound relevant in Azerbaijan, as well as in the Turkic-Muslim world and other countries, and seek a full, fair answer. Expressing his attitude to the unwritten laws of society, the poet does not remain indifferent to the unfortunate fate of the Azerbaijani woman:

*Our merchants will become slaves to Sonyas,
What would you do with the unfortunate Tukezbans, oh my God? (2, 146)*

– saying this, he condemned and protested the positive attitude of our men towards Russian women rather than towards women of their own nation. In social reality, the hero, who is devoid of national thought and is ready to sacrifice millions for the sake of Annas, Lisas, Sonyas, tried to change his outlook on life by reminding him of the problems related to aesthetic thought, Zalkhas, Fatma-Tukezbans.

"The life reflected in Sabir's satirical mirror may be small in scale. However, we should not forget that the picture presented by the poet with the smallest details and strokes is memorable and significant as a necessary aspect of life" (3, 27)

In Sabir's work, science and education issues are very accurately written in unity with upbringing and moral problems, which is a very realistic approach to existing problems. "It is no coincidence that Sabir, as an intellectual who actively responds to the processes taking place in society, writes works promoting science, education, enlightenment and culture, and also writes books for children such as "A Contribution to School Children", "A Contribution to School Students", "Inspire School", "Inspire Science", "The East of School", etc. becomes one of the creators of children's literature with his poems. In these poems, Sabir shows the exceptional role of school in the formation of children as true citizens in society, calls them to school, science, education, and emphasizes the need to be diligent, knowledgeable, and moral. Just as the advice of a father, mother, and teacher is valuable and important for every child, Sabir's poems are equally instructive and irreplaceable. (4, 4)

At the beginning of the 20th century, the problem of the freedom of Azerbaijani women was first raised in the "Shargi-Rus" newspaper, which began publication in Tbilisi on March 30, 1903. Its founder, a prominent representative of Azerbaijani enlightenment, Mahammad agha Shahtakhtli, wrote and published articles on the issues of women's freedom in the Muslim world. His writings on this topic were mainly devoted to the problems that limited women's freedom and isolated them from the surrounding world and public life.

One of the important steps taken against the limited access of Azerbaijani women to education in the early years of the 20th century was the establishment of the Baku Girls' School by H. Z. Taghiyev in October 1901. On the day of the school's grand opening - October 7, 1901 - the "Kaspi" newspaper also published the blessing of the Sheikh-ul-Islam of the Muslims of the Caucasus (Transcaucasia), Akhund Abdusalam Akhundzadeh. He emphasized the words of the Prophet Muhammad that "learning science is obligatory for both Muslim men and Muslim women," and gave examples and quotes from the history of Islam, from the lives of Muslim women who became famous as doctors and scientists, and said: "My goal with these historical quotes is that neither religion nor Sharia restrict women's rights in the field of education and upbringing. If that were the case, so many famous Muslim women would not have grown up in Islam. If girls have not been educated in Transcaucasia until now, the reason is not only the lack of schools, but also the harmful customs that have taken root.

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NATIONAL AND CULTURAL SPECIFICITY OF THE GASTICS UNITS IN THE RUSSIAN AND OTHER LANGUAGES

Aigerim Mussabekova
Bakitgul Zhumagulova
Akerke Altynbek

¹ PhD., Doctoral Student of
Abay Kazakh National Pedagogical University (Kazakhstan, Almaty)
<https://orcid.org/0009-0001-4650-6272>

² PhD Doctor of Philological Sciences,
professor of Abay Kazakh National Pedagogical
University (Kazakhstan, Almaty)
<https://orcid.org/0000-0002-9422-427X>

³ PhD Doctoral Student of
Abay Kazakh National Pedagogical University (Kazakhstan, Almaty),)
<https://orcid.org/0009-0001-8714-9726>

Abstract

Currently, a wide variety of methods are used for the purposes of branding territories, including the increasing importance attached to the concentration of consumer attention on the uniqueness of cultural attributes. As one of such attributes for branding territories, it is proposed to use the richest possibilities of gastics. Gastics a section of cultural studies related to food, the science of iconic and communicative functions of food and beverages.

The purpose of the study is to identify the national and cultural specifics of gastric units in Russian and English.

The object of the study is a comprehensive analysis of general information about gastics.

As a result of the research, we summarize information about the outstanding and communicative functions of food and beverages, as well as the iconic and communicative functions of food, medicines and food.

The article continues the author's series of articles devoted to the study of verbal and non-verbal means of intercultural communication. Gastronomy - the science of food - is considered in the article as a culture reflecting the specifics of national and regional identity.

Keywords: gastics, gastic units, gastronomy, non-verbal, culture, regional identity.

Basic provisions

Gastics is a non-verbal section that studies the cultural role of taste sensations, rituals, traditions related to food, food, cuisine as a reflection of the national mentality. Of course, from the point of view of the layman, culinary art does not seem to belong to the sphere of regional behavior, nor to the sphere of cultural studies or communication.

This is explained by three significant arguments: 1) food reveals, manifests, reflects the mores of the people living in this region; 2) food is an indicator of the general level of civilization of the people of the region, their talent, originality and peculiarities of national thinking, the level of adaptability to the natural conditions of the environment; 3) the national cuisine of the region is one of the criteria for determining the mental makeup of the nation, reflected in the prevailing culinary tastes and food preferences.

Introduction

Gastics is considered primarily from the standpoint of communication in the modern multicultural space. Food appears to be cultured, demonstrating the mores of the people living in a certain region, the mental makeup of the nation, the peculiarities of national thinking, national character, and even "the general level of civilization of the people of the region." Changes in gastronomic priorities are analyzed as objective evidence of serious changes in the national character [6]. In the ethnological approach, food is considered one of the most dynamic elements of culture, the history of nutrition is associated with the history of cultural exchanges and social changes in society. The symbolism of food, ritual and ceremonial diet, and festive treats have traditionally been considered in ethnographic studies as the most important

phenomena of the material culture of certain historical communities. Food is recognized not only for ethnocultural characteristics, but also as a way of ethnic, national, and cultural identity in traditional and modern types of culture [1, 259].

Further localization of consumer preferences led to the realization of the possibilities of using the gastrics resource – the science of iconic and communicative functions of food and drinks, about eating methods, often originating in the pre-written history of peoples, for tourism purposes. At the same time, it became clear that the specifics of local cuisines can also serve the branding of territories. By promoting a particular territory as a tourist destination, travel industry professionals begin to pay attention to focusing on the uniqueness and cultural significance of local cuisines, allowing to better understand the culture and mentality of the people. Currently, this direction is becoming a service trend in a number of countries around the world [2, p. 21.].

The detailed interrelation of national food, mentality and culture can be traced through the examples of countries such as Israel, Italy and Japan. Symbolism and tradition are the features of Israeli cuisine. One of the symbolic dishes of Israel, matzo (a type of traditional bread), recalls the haste with which the Israelis left Egypt. "Haroset" (a mixture of various nuts, honey, wine, cinnamon and apples) is another national dish, symbolizing the clay used by Jewish slaves in construction. Traditionally, this dish is prepared on the Jewish holiday of Passover in memory of the liberation from slavery in Egypt [3, p. 11.].

In Italy, the main dish was and remains pasta, presented in dozens of variations (ravioli, manicotti, tagliatelle, cannelloni, linguine, etc.). Pasta cooking reflects the Italians' ability to create a masterpiece from such simple products as flour and water. As you know, in Japan, food is an aesthetic rite. The Japanese are by nature prone to perfectionism, which can be traced in the national cuisine. For this nation, the design of food is an important factor, containing an element of aesthetics that concerns all aspects of Japanese life.

The use of gastrics is of particular importance in the post-Soviet space, where integration processes in the national development of the Soviet peoples have largely led to the leveling of a number of elements of material culture, such as dwellings, household furnishings, rituals, clothing.

Fortunately, these processes were least affected by traditional national food systems, where the features of ancient cuisine, despite all later influences, are manifested both in the selection of products and in the composition of a number of dishes of modern cuisines. As you know, the national cuisines of the peoples of the world were formed under the complex influence of a number of factors, such as natural conditions, the history of the people, traditional economic activities, and the influence of neighboring peoples. Moreover, even ethnic (including linguistic) proximity in some cases were less important when choosing one or another culinary direction than factors related to places of residence [4, p. 55.].

The objects of gastronomy are usually: local and regional cuisines and their features; food production enterprises, in particular, with historically established traditions or production processes; regions known for the production of certain types of dishes; catering establishments distinguished by authentic service or interactive events (for example, master classes) dedicated to the preparation of traditional national dishes and the history of their origin; gastronomic events; as well as farming and agricultural enterprises.

The first attempts in this direction are demonstrated by the most developed tourist destinations in Russia, such as, for example, the cities of the Golden Ring, members of Associations of small towns in Russia, etc.

The widespread use of Gastrics in the formation of both original regional tourist products and gastronomic brands of the regions contributes to increasing the competitiveness of Russian tourism. It should also be said that in the conditions of the "hurrying world", as a result of the simplification of classical culinary recipes, the exclusion and replacement of some products with others, culinary skills gradually degraded both in home and public catering, and in restaurant cuisine [5, p. 12.].

Materials and methods

There are several concepts of the scientific research method in the article, but they differ slightly from each other. Translated from Greek, the word itself means "path or tracing", the term is based on this and is considered as a way of cognition that helps to achieve a goal with the help of a certain sequence of actions.

The article used the comparison method. As a result of the comparison, it is possible to establish common features or differences with another phenomenon or object. The essential features that will help answer the main questions of the cognitive task should be compared. Identifying the commonalities inherent in two objects is the way to know the patterns.

In general, the cuisine, the peculiarities of the nutrition of the people and their strata best indicate the national inclinations and the national character of the people. Food and drink indicate what priorities people set in life, because the place of food determines the place of other values or joys of life, demonstrates their true role in the culture of a particular people.

The philosophy of food, according to G. Gachev, is as follows: "Food is a religious act. Religion comes from the Latin religare, which means "to reunite, to bind again." Each ethnic group is born on its own land in the same way as plants and animals of different species and breeds. They are all incarnations of the local Cosmos, which for them is a kind of Deity. Food becomes a connecting element between the inner cosmos of man and the outer Nature. Eating is always a sacred act, an act of sacral union of the human body, bone and flesh with the universe in order to be in harmony with it.

In the act of feeding, some parts of the local Nature are sacrificed to prolong the existence of other organisms that are also part of Nature. That is, food is an intermediary between our inner life and the outer world around us, between the large macrocosm around man and his microcosm." That is why diet and ritual fasts for purification are commanded in any religion.

The first distinction in the philosophy of food is its division into natural and cooked. The first type of food can enter our body directly in its present form, without cooking, these are fruits, nuts, berries. They are raised above the ground and soaked in the sun and rain, i.e. Nature itself subjects them to baptism with fire and water. Any matter must undergo such a baptism in order to be admitted to the sanctuary of the human body[6,p. 17].

In addition, these are animal products that we consume in their natural form poultry eggs, animal milk, fish roe. Like fruits, nuts, and berries, they are all the result of the life and development of natural beings. Here is a kind of relay race, a person accepts it from animals and plants in order to continue the relay of Being. The second type of food is cooked food. This means that went through the elements of fire and water, their censorship.

The next distinction is male and female in food, yang food or yin food in terms of Chinese philosophy.

Yang's food is "male", it is rice, grain, wheat, all cereals, nuts, meat, onions, peppers. There is a lot of fire, sun, and energy in this food. It is closer to the Sky and makes a person active and dynamic. Yin food is potatoes, cabbage, and other vegetables. This food contains a lot of moisture, fiber, it is extensive, a lot of inert matter enters our body with it. It makes a person passive, sluggish and sleepy, like herbivorous animals - cows, sheep. Not like meat-eating beasts of prey.[7,p. 14.].

Chinese cuisine can be defined as a kitchen of metamorphoses. The Chinese like to make a rooster out of a fish, a monkey out of a rooster, a tiger out of a monkey, a turtle out of a tiger, and a stone out of a turtle. The prima of Chinese cuisine is Peking duck, as well as sweet pork and candied meat balls. G. Gachev made an ingenious correlation between the distribution of the strength of drinks across the latitudes of the Earth's surface and the mentality of the peoples living there. It is difficult to deny this correlation in logic. So, in the countries of the Islamic region - on the equator, in the tropics, subtropics, i.e. in hot countries, alcoholic beverages are prohibited by the Koran.

The sun is powerful there, there is no need to be heated additionally with high-grade drinks - vodka, ice skate, and other strong libations. The same meaning is in the ban on pork (in Islam and Judaism). The northern peoples, on the other hand, need strong drinks to keep their blood flowing in cold dampness and frosts.

G. Gachev found a certain correspondence between the degree of north latitude and the degree of alcohol consumed there. In the Mediterranean, they drink light wines 8-10% alcohol (Greeks, Italians...)[8,p. 12].

To the north - the Spaniards, the French ... - drink madeira, sherry, port, champagne, i.e. 12-18%. Mountaineers of the Balkans, the Caucasus ... alternate wine with cognac (chacha, rakia ...). Further north, where Germans, British, Poles,

Russians drink vodka, schnapps, rum, grog, whiskey - 40-60% alcohol, which coincides with 40-60 ° north latitude, where these peoples live.

Bacon, pork, and coarse meat are also eaten here, giving energy and warmth. Even further north, near the Arctic Circle, alcohol is drunk 96%. In Tiksi Bay, at latitude 70 °, they drink "Northern Lights" a cocktail of alcohol with champagne 70% alcohol.

It is difficult not to trace the relationship between national food and the type of national mentality. So, in the USA, there is a hamburger, a very significant text, a story and a philosophical thesis about Being. He is a fast food for a business person for whom time is money. A hamburger is prepared for the individualistic feeding of a hurrying loner, unlike a turkey on Thanksgiving Day, leisurely eaten at a large

family table, or unlike the Caucasian crowded and abundant feasts, which do not tolerate individualism and haste, gathered for intimate communication.

Nº	The name of the gastics is their difference	Meaning
1	Food and Philosophy	Food and culinary practices perfectly meet the aspirations of millennial students for self-education and the formation of their personality (self-made person). Our time itself has shaped the philosophy of engagement as a new setting of creativity: conversion from a passive contemplator to a conscious actor, because impressions decorate bodily food with food for the soul.
2	Food and culture	Each culture has its own signature dish, every aspect of which, from the ingredients to the cooking process, taste and even serving, represents a national identity and can tell a lot about the locals and their preferences.
3	Food and language	Food and language, in turn, are closely connected – literally organically – they are united by such a human organ as the oral cavity, the essence of the medium of expression for language and the medium of perception and taste for food – an inevitable meeting place.

A hamburger does not need to have a taste and smell, it is needed pragmatically, to saturate and generate energy, a person refuels with it like a car with gasoline, silently thinking about his business, without a plate and fork, holding it in his hands like a car steering wheel. The American centaur man-in-a-car there is also a hamburger, a model of the world eaten by an American in the daily liturgy. The drink for such a meal is, of course, Coca-Cola, a product of industry and chemistry. A good American housewife is considered to be the one who knows how to buy something that does not require any time and effort on her part for home cooking. Fast food is a direct expression of the American mentality[9,p,81].

Results and discussion

Cuisine occupies a special place in Russian culture. Probably, like no one else, Russians love to eat, they see food as a special pleasure of life. Gluttony is treated with humor rather than condemnation, the gluttony of the heroes of Rabelais or the English Robin-Bobin-Barabek is not able to impress anyone[10,p.14].

According to the way a person eats ("everything and more"), in Russian villages they have long guessed a good groom, according to the principle "as he breaks, so he will sink." A good appetite has always been considered a sign of health, physical and mental, and health itself was measured in kilograms of added weight. In Russian literature, much attention has been paid to the description of viands and snacks as a necessary characterization of characters (Gogol, K. Tolstoy, Chekhov, Gilyarovsky, etc.).

Russian cuisine is based on two types of economy: 1) Ugro-Finnish gathering; 2) Slavic agriculture.

These two foundations, the gathering economy and the producing economy, in their unique combination gave a special flavor to Russian cuisine. All other influences and borrowings were only strung on these two rods, adapting to the culture of the people. The first type of farming, commercial gathering, manifests itself in a special predilection for "wild" products, such as mushrooms, berries, herbs, roots, wild birds, wild honey, wild animals caught hunting, fish, crayfish, etc. Moreover, the harsher and colder the climate, the less "wild" products are subjected to culinary processing.

In the Siberian North, for example, fish is eaten either without processing at all (tugun), or washed in a saline solution. Stroganina is common here frozen fish, cut into shavings. After killing a deer, they eat the liver still hot. Raw food is widespread precisely in the North due to the almost complete sterility of the environment, the slow course of many biological processes, such as rotting, and the abundance of healing essential oil plants in the Baikal taiga[11,p.25].

The second type, the agricultural nature of production, is reflected in the predominance of vegetable food ("Cabbage soup and porridge are our food"), in the fact that the main food product is always bread (khlebovo, edovo) originally liquid (hence the word bread at first it was slurped with spoons from bowls tyura, porridge), and only then did they begin to bake it. To this day, food without bread looks strange and does not take root on the Russian table.

From the same time, communal feasts and folding tables have been preserved, reflecting the inherently collectivist nature of the Russian person, his craving for community, conciliarity: all food falls into a common pot; hence the selyanka, or a combined hodgepodge all sorts of things cooked together.

There is also a third core principle that unites the first two agriculture and fishing this is the constant fear of hunger. Russia, perhaps, has always been a totalitarian country because the bony hand

of hunger often reached out to its people, aggravated by the uncertainty of the weather and harvest, this fear of hunger whetted the appetite and forced them to make supplies and supplies.

Russian cuisine is characterized by seasonality both in the selection of products and in their preparation. It has a pronounced connection with the annual seasonal cycle. Four main long church fasts (before Christmas, before Easter, Petrovsky (June July), Bogoroditsky (August)) they took root because they coincided calendar-wise with periods of starvation or limited food resources.

Meat eaters coincided either with the slaughter of livestock (from Christmas to Shrovetide), or with the hunting season (from October), or followed the lambing (farrowing) - Easter feeding. The modern problem of Russian cuisine is not at all in its spread around the world and imposing on others, but in preserving traditions and all historical experience under the pressure of cosmopolitan and unified technologies[12].

The concept of culture is always opposed to the concept of nature, i.e. nature. "Culture is always considered as a set of certain signs (cultures), correlating with a certain element of reality to denote and express some reality.

In culture, a linguistic sign (form and content) denoting, and the reality is denoted. Realities mean everything related to culture: objects, functions, customs, facts of behavior".

Food is always cultured, i.e. a manifestation of the specifics of the culture of the nation living in the region. There are four aspects of bodybuilding that run through all spheres of culture: 1) material (tools, structures and other artifacts, technical methods of their creation); 2) spiritual (ideas, teachings, superstitions, etc.); 3) behavioral (etiquette, rituals, reactions, gestures, etc.); 4) organizational (distribution of elements of a given sphere in time and space, laws).

For example, in the field of nutrition there is a material aspect of culture (products, kitchen utensils, cooking methods); spiritual (food prohibitions, beliefs, fasts, etc.); behavioral (table behavior, rituals cheese as an appetizer for Russians and as a dessert for the British and French; we say thank you at the end of the meal, the French usually praise each dish); organization-on-time - meal time during the day and year, organization food in the family and outside the home (fast food in the USA - cf. with a Georgian feast). Nutrition can be semiotically significant, i.e. it can act as a social sign, as a symbol of an event:

Accepting this position, it should be agreed that the energy received by a person in the process of eating is related to the source and the general law of synergetics the law of interaction of the subject with his environment, close to the theory of self-organization of systems.

That is why evolution, changes, shifts, failures, and a change in the course of the culinary art of a particular nation indicate in the most objective way serious changes in the national character, and therefore they should be studied by regional scientists, communicators, politicians, demographers, psychologists, and diplomats who would like to understand, conquer, or thoroughly study one or another a country, a particular region, a particular people.

Conclusion

Gastics studying the cultural role of taste sensations, rituals, traditions related to food, cuisine, reflects the national mindset of each region and country. The meaning of food is the study of culture through food consumption. This is explained by three significant arguments: 1) food - reveals, manifests, reflects the mores of the people living in this region; 2) food is an indicator of the general level of civilization of the people, their talent, originality and peculiarities of national thinking, the level of adaptability to the natural conditions of the environment; 3) the national cuisine of the region is one of the criteria for determining the mental makeup of the nation, reflected in the prevailing culinary tastes and food preferences.

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Technical sciences

SCIENTIFIC CHOICE OF RATIONAL TECHNOLOGY FOR DRYING DISPERSED MATERIALS WITH EFFECTIVE HYDRODYNAMIC MODES

Sazhin Victor

*Doctor of Technical Sciences, Distinguished Professor, Director of the Fund,
Russian investment and innovation Fund "Scientific Perspective",
Moscow, Russian Federation*

НАУЧНЫЙ ВЫБОР РАЦИОНАЛЬНОЙ ТЕХНИКИ ДЛЯ СУШКИ ДИСПЕРСНЫХ МАТЕРИАЛОВ С ЭФФЕКТИВНЫМИ ГИДРОДИНАМИЧЕСКИМИ РЕЖИМАМИ

Сажин Виктор Борисович

*доктор технических наук, профессор, академик, директор Фонда,
Российский инвестиционно-инновационный Фонд «Научная Перспектива»,
г. Москва, Российская Федерация*

Abstract

The paper shows the application of efficient hydrodynamic regimes of a suspended layer for significant intensification of heat and mass transfer processes. The prospects of using vortex regimes for drying dispersed materials are proven. A strategy for rational selection of equipment for the drying section based on the critical pore diameter and the rank of adhesive-autohesive interaction for the material being dried is developed. Multifunctional devices have been developed that allow combining various processes in one device, for example, efficient drying with simultaneous capture of even nanosized dust. An approach using exergy analysis is presented that minimizes possible emissions of heat and dust into the environment. It is recommended to use the experience of the Russian Engineering Academy in engineering and technical support when implementing nature-like technologies.

Аннотация

Показано применение эффективных гидродинамических режимов взвешенного слоя для существенной интенсификации тепломассообменных процессов. Доказана перспективность применения вихревых режимов для сушки дисперсных материалов. Разработана стратегия рационального выбора аппаратного оформления отделения сушки по критическому диаметру пор и рангу адгезионно-аутогезионного взаимодействия для высушиваемого материала. Разработаны многофункциональные аппараты, позволяющие совмещать различные процессы в одном аппарате, например, эффективную сушку с одновременным улавливанием даже наноразмерной пыли. Изложен подход с использованием эксергетического анализа, минимизирующий возможные выбросы тепла и пыли в окружающую среду. Рекомендовано использовать опыт Российской инженерной академии по инженерно-техническому сопровождению при внедрении природоподобных технологий.

Keywords: hydrodynamics, vortex, drying, efficiency, exergy, ecology, nature-like

Ключевые слова: гидродинамика, вихрь, сушка, эффективность, эксергия, экология, природоподобный

Интенсивность тепломассообмена в большинстве технологических процессов во многом определяется гидродинамической обстановкой в аппарате. При оптимальном применении гидродинамические режимы получили название эффективных, так как сочетают интенсивность с экономичностью и высоким качеством готового продукта. В мировую научную практику термины «активные гидродинамические режимы» (1961) и «эффективные гидродинамические режимы» (2000) введены Б.С. и В.Б. Сажинными [1-8].

Ярким примером влияния активизации гидродинамики на эффективность процесса может служить производство напалма (Б.С. Сажин был одним из основных исполнителей при разработке технологии и пуске в 1961 г. промышленного производства напалма в СССР). Сушка

и поликонденсация нафтенных кислот – основа производства напалма, осуществлялась в фильтрующем слое при температуре 40–45°C, т.к. при большей температуре происходило так называемое «стеклование», что по технологическим условиям недопустимо. В результате применения активных гидродинамических режимов процесс стал осуществляться в двухступенчатом агрегате со взвешенным слоем в открытых в процессе исследований режимах проходящего кипящего слоя и свободного фонтанирования, что сократило продолжительность процесса с 70 часов до 40 секунд, т.е. в несколько тысяч раз (рисунок 1). При этом оказалось возможным из-за кратковременного воздействия применять без потери качества температуры до 230°C.

Эффективным гидродинамическим режимом для второй задачи будет виброкипящий слой, в то время как для первой задачи он таковым заведомо не является, ведь эффективный гидродинамический режим должен обеспечить сочетание интенсивности, экономичности и качества получаемого продукта с учетом затрат (не только по основному аппарату, но и всей установке, включая вспомогательное оборудование).

Известно, что мощным средством интенсификации процессов сушки является применение режимов взвешенного слоя [8-17]. Однако, отнесение всех сушилок со взвешенным слоем заведомо к сушилкам с эффективными гидродинамическими режимами в корне ошибочно, так как каждый гидродинамический режим может быть эффективным только для определенной группы материалов, сходных по своим свойствам. Основным критерием при этом может служить характеристика структуры пор в высушиваемом материале, определяющая диффузионное сопротивление при сушке и необходимое время обработки материала во взвешенном слое, достаточное для достижения требуемой остаточной влажности.

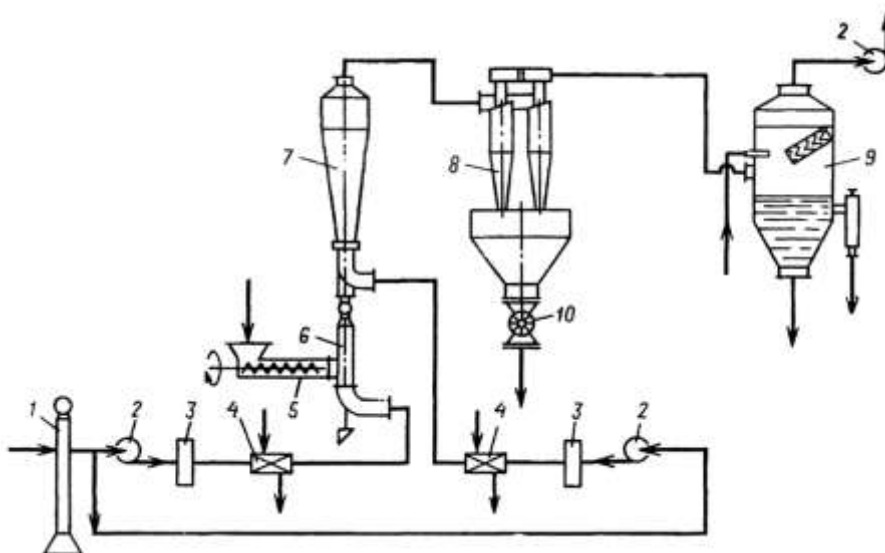


Рисунок 1. Реализация промышленного производства отечественного напалма в СССР (разработка Б.С. Сажина - для открытой публикации)

В качестве основного показателя размеров пор материала предложен критический размер пор $d_{кр}$ (наименьший диаметр пор, из которых по технологическим условиям надо удалять влагу), позволяющий оценить наибольшее в процессе сушки эффективное диффузионное сопротивление (то есть сложность технологической задачи и необходимое время обработки в условиях взвешенного слоя). Критический диаметр пор $d_{кр}$ может быть определен из кривых распределения пор по размерам, полученных на основе совместного анализа изотерм сорбции-десорбции и уравнения Томсона-Кельвина [1-5]. Использование для этой цели других методов (ртутной или газовой порометрии, микроскопического анализа и др.) в отличие от указанного метода позволяет определять чисто геометрические размеры пор без учета взаимодействия удаляемой влаги со стенками пор материала. Разработаны экспресс-методы определения критического диаметра пор [10, 18-23]. Предложена классификация материалов по величине критического диаметра пор и величине адгезионно-аутогезионного коэффициента, характеризующего эффекты комкования влажных материалов в процессе сушки и налипания на стенки аппаратов. Согласно указанной классификации материалы разделены на шесть классов, охватывающих весь диапазон размеров пор (от 100 до 2 нанометров). Осуществлена также классификация гидродинамических режимов взвешенного слоя [24] и рекомендованы типовые

сушилки с активными гидродинамическими режимами для каждой группы материалов [25]. Так, для широкопористых материалов с критическим размером пор $d_{кр}$ более 100 нанометров (нм) рекомендованы в зависимости от величины показателя адгезионно-аутогезионных свойств высушиваемых материалов сушилки с режимами пневмотранспорта, циклонным и аэрофонтанным режимом. Для тонкопористых материалов ($d_{кр}$ 6-4 нм) рекомендованы дисковые вихревые сушилки, а для микропористых материалов ($d_{кр}$ 4-2 нм) рекомендованы сушилки с виброкипящим слоем.

Нами с Б.С. Сажиним, коллегами и учениками [1-5, 26, 27-31] разработан метод сравнительной оценки активности гидродинамических режимов с использованием эксергетического анализа по величине эксергетических коэффициентов полезного действия [5], позволяющий объективно оценить конкурирующие разработки новых сушилок для одних и тех же материалов. Выражение для расчета эксергетического коэффициента полезного действия можно получить исходя из балансовых соотношений (1, 2) по теплу и массе. Используя закон аддитивности (соотношение 3), можно из (1-3) получить уравнение (4), а вводя безразмерные комплексы (5), связанные с кинетическими коэффициентами α и β , из соотношения (4) получим (6) и далее выражение (7) для эксергетического КПД.

$$G_m \Delta h_m + W z_n = \alpha F \Delta t_{cp}. \quad (1)$$

$$G_m \Delta U_m = \beta F \Delta x_{cp}. \quad (2)$$

$$\Delta h_c = c \Delta t_c + h_m \Delta x_c \quad (3)$$

$$\Delta h_c = G_m \Delta h_m \frac{c}{\delta \alpha F} + \frac{c \beta}{\delta \alpha} \Delta x_{cp} \cdot h_n + \Delta x_{cp} \cdot h_n \quad (4)$$

$$L_e = \frac{c \beta}{\alpha}, g = \frac{G_c}{G_m}, n = \frac{\beta F}{G_c} \quad (5)$$

$$\Delta h_c = \frac{L_e}{g n} \Delta h_m + \left(1 + \frac{L_e}{\delta}\right) \Delta x_{cp} \cdot h_n, \quad (6)$$

где Δx_{cp} – средняя движущая сила процесса; $\delta = \frac{\Delta t_{cp}}{\Delta t_c}$

$$\eta_e = \frac{\Delta e_n}{\Delta e_c} = \frac{\frac{1 - L_e \Delta e_m}{g n \Delta e_c}}{\frac{1 + L_e}{\delta} \Delta x_{cp}} \quad (7)$$

Необходимо сопоставлять полезный эффект, получаемый в результате использования активных гидродинамических режимов, с затратами на их реализацию. В качестве показателя, характеризующего термодинамическую эффективность используемых методов активизации гидродинамической обстановки в аппарате, целесообразно использовать отношение эксергетических коэффициентов полезного действия до и после применения указанных методов или для альтернативных технических решений различных авторов. В этом случае активным (применительно к конкретному материалу и аппаратному оформлению) следует считать гидродинамический режим, для которого указанный показатель достигает наибольшего значения. Эксергетический КПД также может служить комплексным показателем для оценки гидродинамического режима и степени загрязнения окружающей среды тепловыми выбросами, которые характеризуют экологическую чистоту промышленной установки. Например, в сушильной установке с активным гидродинамическим режимом наибольшим изменениям подвергается термическая составляющая эксергии взаимодействующих потоков, поэтому

можно воспользоваться эксергетической температурной функцией для перехода от тепловых характеристик этих потоков к эксергетическим. Для более полной характеристики сушильной установки необходимо ввести в эксергетический КПД η_e составляющую, учитывающую гидравлическое сопротивление аппарата и энергозатраты, обусловленные выделением высушенного продукта из газовой фазы или на пылеочистку, независимо от того, проводится это процесс непосредственно в сушильном аппарате или вне его (8)–(10).

$$\eta_{\text{э}} = \frac{k_1 \eta_e + k_2 \eta_{\text{сеп}}}{2} \quad (8)$$

$$\eta_{\text{сеп}} = \frac{\eta_{\text{г}} + \eta_{\text{ул}}}{2} \quad (9)$$

$$\eta_{\text{г}} = \frac{\ln(P^{\text{ВХ}} - \Delta P) - \ln P_o}{\ln P^{\text{ВХ}} - \ln P_o}, \quad (10)$$

где k_1, k_2 – относительный уровень ущерба от тепловых и пылевидных загрязнений;
 $P^{\text{ВХ}}, P_o, \Delta P$ – давление соответственно на входе в аппарат, окружающей среды и гидравлическое сопротивление аппарата.

Результаты эксергетического анализа показывают, что эффективные гидродинамические режимы являются ресурсосберегающими не только в отношении металла и производственных площадей (за счет малых размеров аппаратов), но и в отношении удельного расхода энергии.

Теплообменники являются неотъемлемой частью практически любой производственной установки в химической технологии. Эффективность их работы во многом определяется качественными и количественными показателями целевого продукта. В связи с этим получение объективной оценки совершенной работы теплообменников применительно к их заданным конструктивным и технологическим характеристикам является важной практической задачей. Для оценки эффективности работы теплообменников на практике используется тепловой КПД η_T , определяемый как отношение количества фактически переданного в аппарате тепла от одного теплоносителя к другому к максимально возможному теоретически при заданных их термических потенциалах. В соответствии с этим подходом расчетная формула для этого показателя может быть представлена в виде [3]:

$$\eta_T = \frac{w_{\text{н}} \Delta t_{\text{н}}}{w_{\text{мин}} \Delta t_{\text{max}}} = \frac{w_{\text{с}} \Delta t_{\text{с}}}{w_{\text{мин}} \Delta t_{\text{max}}} \quad (11)$$

где $w_{\text{н}}, w_{\text{с}}$ $\left(\frac{\text{КДж}}{\text{кг} \cdot \text{с}} \right)$ – тепловые эквиваленты нагреваемой и греющей сред

$w_{\text{мин}} = \min(w_{\text{н}}, w_{\text{с}})$, $\Delta t_{\text{н}}, \Delta t_{\text{с}}$ – разность температур теплоносителей на входе и выходе из аппарата.

Количественная оценка η_T , как следует из определения этого показателя, в общем случае является функцией не только температур и тепловых эквивалентов теплоносителей, но зависит и от гидродинамической обстановки в аппарате и его конструктивных характеристик. Указанные факторы находят отражение в коэффициенте теплопередачи K $\left(\frac{\text{Дж}}{\text{м}^2 \cdot \text{с}} \right)$, площади поверхности контакта F (м^2) и схемы движения теплоносителей.

Расчетное соотношение, определяющее зависимость η_T от перечисленных факторов может быть получено на основе решения системы соответствующих уравнений для анализируемого аппарата. Для теплообменников с фиксированной поверхностью контакта сред эта схема в дифференциальном виде имеет вид:

$$dQ = K(t_z - t_h)dF \quad (12)$$

$$dQ_z = -w_z dt_z \quad (13)$$

$$dQ_h = -w_h dt_h \quad (14)$$

где dQ – количество тепла (Дж/с), переданное от греющей к нагреваемой среде на элементе поверхности.

Использование балансовых уравнений в дифференциальной форме позволяет пренебречь бесконечно малыми изменениями температур теплоносителей и считать их неизменными на элементарном участке поверхности dF . Из системы уравнений (12)-(14) следует соотношение, определяющее взаимосвязь между термическими характеристиками теплоносителей и технологическими и конструктивными параметрами процесса. Оно может быть представлено как результат разделения переменных соответствующих дифференциальных уравнений:

$$\frac{d(t_z - t_h)}{(t_z - t_h)} = -\left(\frac{1}{w_z} + \frac{1}{w_h}\right)KdF \quad (15)$$

Интегрирование полученного соотношения по всей поверхности аппарата возможно при известной функциональной зависимости температур теплоносителей от поверхности контакта. Последнее непосредственным образом определяется схемой движения теплоносителей в аппарате. Для канонических схем движения (прямоток и противоток) результат интегрирования уравнения (15) получен в виде аналитических зависимостей

$\Delta t_z = (t'_z - t''_z)$ и $\Delta t_h = (t''_h - t'_h)$ от безразмерного комплекса $\left(\frac{KF}{w_z}\right)$ и тепловых

эквивалентов теплоносителей. Наличие этих функциональных соотношений представляет возможность получить расчетное уравнение для оценки η_T . Такие зависимости получены в работе и обобщены в виде универсальной формулы следующего вида:

$$\eta_T = \frac{1 - e^{-\varphi}}{1 + (-1)^p \left(\frac{w_z}{w_h}\right) e^{-\varepsilon\varphi}} \left(\frac{w_z}{w_h}\right)^n \quad (16)$$

где $\varphi = \left(1 + \frac{w_z}{w_h}\right) \frac{KF}{w_z}$, ε, φ, n - параметры процесса, зависящие от гидродинамической

обстановки в аппарате; $p=0$ (прямоток), $p=1$ (все схемы движения, отличные от прямотока); $n=0$, если $w_{\min} = w_z$, $n=1$, если $w_{\min} = w_h$; ε - параметр, характеризующий отличие реальной схемы движения теплоносителей от канонической, $\varepsilon = 0$ для прямотока, $\varepsilon = 1$ для противотока, $0 < \varepsilon < 1$ для неканонических схем движения. Оценка показателей в этом случае производится по рекомендациям в специальной литературе.

Представленная обобщенная зависимость является универсальной и позволяет проводить оценку эффективности работы теплообменника и его оптимизацию при заданных конструктивных размерах и расходных характеристиках и энергетических потенциалах теплоносителей на входе в аппарат. По алгоритму аналогичному с поверочным расчетом теплообменников можно определить оптимальную тепловую нагрузку аппарата и

характеристики теплоносителей на выходе для заданного технологического режима. К недостаткам критерия η_T следует отнести его ограниченную область применения (рекуперативные аппараты, в которых теплоносители не изменяют агрегатного состояния) и тот факт, что балансовое уравнение, лежащее в его основе, не содержит статей, отражающих потери, обусловленные необратимостью процессов теплообмена и гидравлическим сопротивлением аппарата. Указанных недостатков лишен эксергетический

КПД η_e , целесообразность практического использования которого для оценки эффективности работы теплообменников обоснована ранее [2-7, 27, 30-38]. Там же представлены и все необходимые расчетные соотношения для его оценки. Наличие разных критериев эффективности теплообмена η_T и η_e обуславливает необходимость установления взаимосвязи между ними с целью определения оптимальной области применения для каждого из них. Полученная в процессе исследования функциональная связь между термическими характеристиками теплоносителей $\Delta t_z, \Delta t_n$ и η_T , а также известные расчетные соотношения для η [6-8, 27, 39-43] позволяют представить корреляционную связь между критериями η_T и η_e в виде:

$$\eta_e = \frac{1 - \frac{w_n}{w_{\min}} \cdot \frac{T_0}{\eta_T(T'_z - T'_n)} \ln \left[1 + \eta_T \frac{w_{\min}}{w_n} \left(\frac{T'_z}{T'_n} - 1 \right) \right]}{1 + \frac{w_z}{w_{\min}} \cdot \frac{T_0}{\eta_T(T'_z - T'_n)} n \left[1 - \eta_T \frac{w_{\min}}{w_n} \left(\frac{T'_z}{T'_n} - 1 \right) \right]} \quad (17)$$

где T_0 - температура окружающей среды ($^{\circ}\text{K}$).

Уравнение (17) позволяет произвести сопоставительную количественную оценку критериев η_T и η_e в одних и тех же условиях работы теплообменника. Результаты таких расчетов показывают, что в условиях, когда температура греющей среды на входе и аппарат T'_z превосходит температуру окружающей среды T_0 в 1,5 раза и более, а начальная температура нагреваемой среды T'_n близка к T_0 , количественные оценки обоих критериев

отличаются не более чем на 5-7%. В остальных случаях значение η_e меньше чем η_T , что обусловлено ростом относительной доли потерь тепловой энергии, вызванных необратимостью протекающих в теплообменнике процессов. Тепловой КПД этих потерь не учитывает.

Эксергетический КПД является комплексным показателем для оценки гидродинамического режима и степени загрязнения окружающей среды тепловыми выбросами, которые характеризуют экологическую чистоту сушильной установки [6, 11, 17, 24, 25, 27, 43-48]. Результаты эксергетического анализа показывают, что эффективные гидродинамические режимы являются ресурсосберегающими не только в отношении металла и производственных площадей (за счет малых размеров аппаратов), но и в отношении удельного расхода энергии. Разработанный метод оценки эффективности гидродинамических режимов позволяет среди альтернативных технических решений выбрать объективно лучшее. Пример – сушилки для поливинилхлорида (ПВХ) (работы НИИХИММАШ, МИХМ, МГТУ, РосЗИТЛП. (Здесь и далее для указания приоритета в исследованиях упоминаем прежние названия организаций, которые в настоящее время либо переименованы, либо входят структурными подразделениями в новые). Модернизированная установка на основе трубы-сушилки, включающая 8 основных аппаратов (рисунок 2) была успешно заменена сушилкой вихревого типа, являющейся аппаратом с активным для данного материала гидродинамическим режимом. Установка (рисунок 3)

включает всего 2 основных аппарата и к тому же обеспечивает санитарную очистку отходящего газа.

В МГТУ им. А.Н. Косыгина проведены исследования процессов тепло - и массообмена в вихревых многофункциональных аппаратах с активной гидродинамикой, которые позволили сделать вывод о перспективности использования вихревого многофункционального аппарата (ВМФА) на базе аппарата со встречными закрученными потоками (ВЗП) с целью утилизации теплоты паровоздушных выбросов.

В таком аппарате (рисунок 4) обеспечиваются высокие скорости потока (5-25 м/с) газа без снижения эффективности улавливания влаги. Одним из основных преимуществ вихревого аппарата является наличие в рабочем объеме аппарата высокоразвитой поверхности теплообмена, включающей в себя капельную, пленочную и пенную поверхности раздела фаз, и возможность регулировать их соотношение путем управления кратностью расходов охлаждаемого газа.

Основой для описания процессов переноса теплоты и массы в материальной среде служили дифференциальные уравнения неразрывности, движения, теплопроводности, диффузии и др. Для описания конкретного процесса передачи теплоты и массы к указанным уравнениям добавлены соответствующие граничные условия.

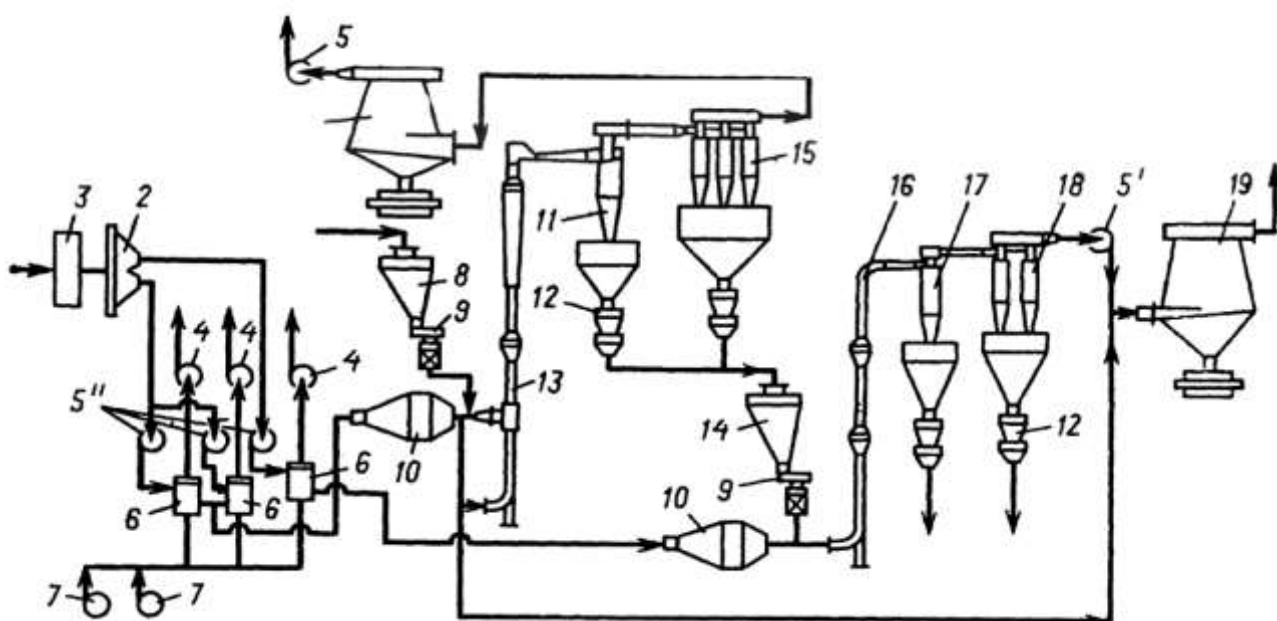


Рисунок 2. Модернизированная сушильная установка в отделении сушки поливинилхлорида на базе трубы-сушилки ТС-2-600: 1 - циклон-промыватель СИОТ 115Ф006; 2 - масляный фильтр; 3 - паровой калорифер; 4 - дымосос Д-8;

5 - вентилятор ВВД-11; 6 - воздухоподогреватель; 7 - вентилятор ЦП-40 № 8;

8 - бункер исходного продукта; 9 - тарельчатый питатель; 10 - фильтр;

11 - циклон ЦН-15 диаметром 1410 мм; 12 - двойной затвор; 13 - труба-сушилка первой ступени; 14 - бункер подсушенного продукта; 15 - циклон ЦН-15 диаметром 550 мм; 16 - труба-сушилка второй ступени; 17 - циклон ЦН-15 диаметром 900 мм; 18 - циклон ЦН-15 диаметром 400 мм; 19 - циклон-промыватель СИОТ 113Ф006.

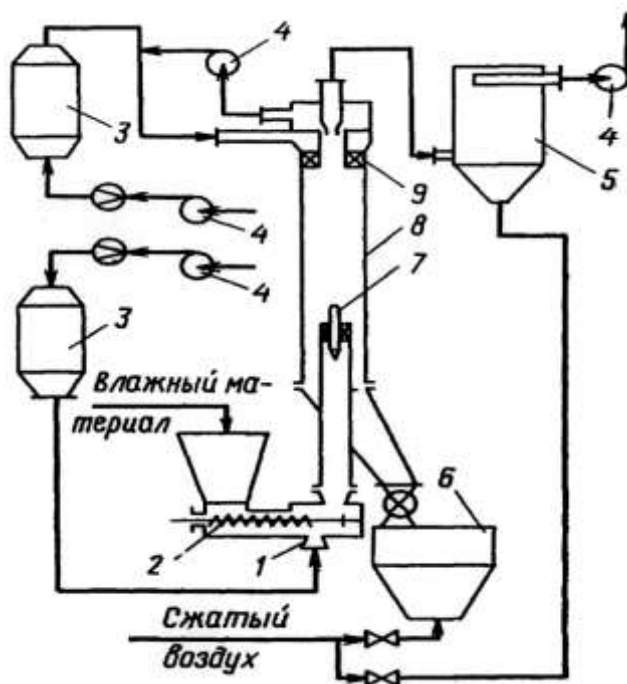


Рисунок 3. Сушильная установка с активным гидродинамическим режимом в отделении сушки поливинилхлорида на базе многофункционального аппарата со встречными закрученными потоками (разработка Б.С. и В.Б. Сажиных с сотрудниками): 1 - подвод горячего газа; 2 – шнековый питатель; 3 – калорифер; 4 - вентиляторы нагнетательные и отсасывающий; 5 – санитарная очистка отходящих газов; 6 – бункер для сухого продукта; 7 – завихритель; 8 – сушилка ВЗП; 9 – ввод горячего газа

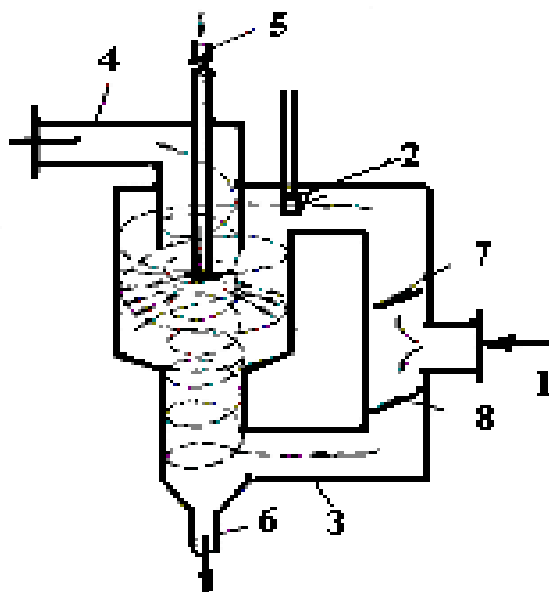


Рисунок 4. Вихревой аппарат модифицированной конструкции: 1 – подвод выбросного воздуха; 2 – рукав для нисходящего потока; 3 – рукав для восходящего потока; 4 – патрубок для отвода воздуха; 5 – устройство подвода жидкости с распылительной форсункой; 6 – отвод обработанной жидкости; 7, 8 – верхний и нижний регулирующие шиберы.

Решение системы дифференциальных уравнений проводилось численным методом Рунге-Кутты. Полученные результаты оказались в хорошем соответствии с экспериментальными данными. На основании теоретических и экспериментальных данных получены критериальные зависимости для проведения инженерных расчетов вихревых аппаратов с активной гидродинамикой.

Нами под руководством Б.С. Сажина, совместно с сотрудниками и учениками НИИхиммаш, МГТУ и МГУИЭ разработаны многофункциональные безуносные аппараты с встречными закрученными потоками и управляемой гидродинамикой (ВЗП), которые реализуют эффективные гидродинамические режимы при сушке дисперсных материалов с критическим диаметром пор 6 нанометров (рисунок 5).

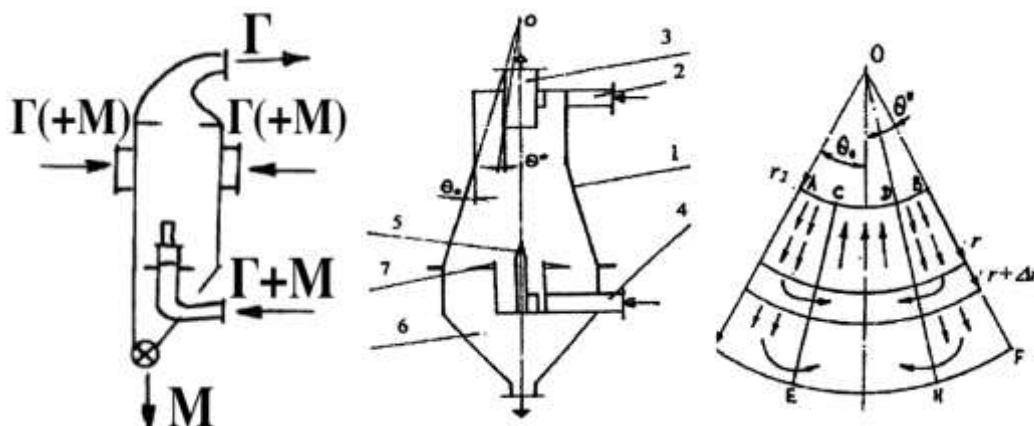


Рисунок 5. Аппарат со встречными закрученными потоками (ВЗП): эскиз аппарата ВЗП: Г – газ, М – материал; аппарат ВЗП с расширяющимся конусом (ВЗП РК) и схема потоков в нем: 1- конический, расширяющийся к низу корпус аппарата; 2-верхний периферийный тангенциальный ввод запыленного газа; 3-патрубок выхода очищенного газа; 4-нижний центральный тангенциальный ввод запыленного газа; 5-вытеснитель; 6-бункер уловленного материала; 7-отбойная шайба

Нами совместно с Б.С. Сажиним, М.Б. Сажиной, коллегами и учениками обоснован, открыт, изучен и применён неизвестный ранее гидродинамический режим вращающегося кольцевого слоя, что позволило увеличить время пребывания высушиваемого материала в аппарате ВЗП в 5 – 6 раз и на несколько тысяч наименований расширить ассортимент материалов, высушиваемых в встречных закрученных потоках. Примером широкого распространения аппаратов с активной гидродинамикой могут служить пылеуловители ВЗП, превосходящие по своим показателям не только осадительные камеры, но и циклоны всех систем. Здесь уместно подчеркнуть, что пылеуловители ВЗП превосходят даже батарейные пылеуловители (конструкции НИОГАЗ. и др.), а также тканевые фильтры (в области рационального применения аппараты ВЗП при улавливании наноразмерной пыли при одинаковой степени пылеулавливания с фильтрами существенно экономнее по энергозатратам и потребной производственной площади, а также имеют меньшую металлоёмкость).

Аппараты ВЗП отличаются высоким уровнем скоростей. Такие пылеуловители получили широкое распространение в ряде отраслей промышленности. Только для заводов переработки хлопчатника их было изготовлено и установлено более 8 тысяч, что позволило предотвратить региональную экологическую катастрофу (существовавшие технические средства не могли справиться с вредными выбросами хлопковой пыли) и не допустить экономического коллапса Республики Узбекистан (возникшего бы вследствие закрытия одной из финансово наиболее успешных отраслей промышленного производства).

Пример ощутимой выгоды от использования эффективных гидродинамических режимов в промышленном процессе - термическая обработка волокнита. Так малопроизводительные, энергоёмкие и громоздкие ленточные аппараты с продуваемым движущимся слоем были заменены на дисковые вихревые аппараты с вращающимся слоем, что позволило сократить время обработки в десятки раз, в сотни раз сократить занимаемые оборудованием площади производственных помещений и почти в 100 раз уменьшить расход металла на изготовление аппаратов.

В настоящее время эффективные гидродинамические режимы нашли широкое применение в ряде технологических процессов химической, пищевой и текстильной отраслей промышленности, в частности в красильно-отделочных производствах для процессов тепло-влажностной обработки, промывки, пропитки и др. (работы МГТУ им. А.Н. Косыгина).

В настоящее время аппараты ВЗП широко используются в технологических процессах в качестве эффективных аппаратов для проведения тепломассообменных процессов, например,

процессов сушки [7-15, 49-52].

Установлена эффективность применения вихревых пылеуловителей ВЗП в качестве воздухоочистительного устройства теплоэнергетических установок турбинного типа [16-20].

Коэффициент гидравлического сопротивления ВЗП может быть вычислен по двум параметрам – кратности расхода K^* (по каналам) и коэффициенту гидравлического сопротивления ξ^* , которые связаны соотношением

$$\xi^* = \xi_1 (1 - K^*)^2 \quad (18)$$

Получено соотношение между коэффициентом гидравлического сопротивления каналов первичного и вторичного потоков и кратностью расхода K^* в виде уравнения

$$\frac{\xi_1}{\xi_2} = \frac{K^{*2}}{(1 - K^*)^2} \quad (19)$$

Эффективность пылеуловителя имеет логарифмически нормальное распределение и определяется из выражения

$$\eta_0 = (1 - K)\eta_1\eta_2, \quad (20)$$

где η_1, η_2 – фракционные коэффициенты очистки газа, поступающего по первому и второму каналу, которые могут быть определены из выражения:

$$\eta_{1,2} = \sum_{i=1}^N \Phi_i(x_{1,2}) \eta_{1,2} \quad (21)$$

$$\Phi_{1,2} = \frac{1}{2\pi} \int_{-\infty}^{x_{1,2}} e^{-\frac{x^2}{2}} dx \quad (22)$$

где $\Phi_{1,2}$ – интеграл вероятности.

Значение $\Phi(x)$ может быть определено полиномом второй степени.

Зависимость характеристик эффективности вихревого пылеулавливания и улавливаемой пыли определяется выражением

$$x_{1,2} = \lg \frac{\delta_m}{\delta_{1,2\eta=50}} / \sqrt{\lg^2 \sigma + \lg^2 \sigma_{1,2\eta=50}} \quad (23)$$

где δ_m – размер улавливаемых частиц, $\sigma_{1,2\eta=50}$ и $\sigma_{1,2\eta}$ параметры кривой фракционной эффективности.

Параметр $\sigma_{1,2\eta}$ слабо зависит от кратности расхода и может быть принят постоянной величиной. Параметры $\sigma_{1,2\eta=50}$ зависят от кратности расхода и могут быть определены из формул:

$$\delta_{1\eta=50} = \delta_{1\eta=50}^* \sqrt{1 - K^* / 1 - K} \quad (24)$$

$$\delta_{2\eta=50} = \delta_{2,1\eta=50}^* \sqrt{\frac{K^*}{K}} \quad (25)$$

где $\delta_{1,2\eta=50}$ – опытные значения при заданной степени кратности K^* (соотношения потоков по каналам).

Вихревые аппараты, использующие эффект Ранка – Хилша, принципиально отличаются от известных типов вихревых аппаратов, относящихся к аппаратам со взвешенным слоем

материала, хотя в них также как и в аппаратах ВЗП используется два взаимодействующих закрученных потока. Их часто называют вихревыми трубами (ВТ). В аппаратах ВТ происходит термодинамическое разделение потоков на горячий и холодный. Они нашли применение для небольшой производительности главным образом в криогенных процессах, хотя имеются предложения по их использованию и в других процессах, в том числе промышленных масштабов. Так ещё в 70-е годы прошлого столетия были запатентованы ВТ в качестве сушилок (авторы патента Б.С. Сажин и В.Б. Сажин). В последние годы появились исследования по использованию ВТ в качестве теплообменников с одновременным улавливанием пыли из пылегазовых смесей [28-30]. Л.А. Тарасовой разработана комбинированная система очистки воздуха от пыли циклон - вихревой компрессор и предложена методика её гидравлического расчёта, по её данным, ВТ низкого напора могут быть многоцелевыми аппаратами (подобно ВЗП) и выполнять дополнительные функции пылеуловителя и осушителя газового потока. Однако вывод о том, что при этом термодинамическая эффективность не меняется, представляется недостаточно убедительным. Пока не нашли подтверждения и выводы, что вихревой водокольцевой компрессор может выполнять дополнительную функцию пылеуловителя без изменения эксплуатационных характеристик и применяться в качестве «мокрой» ступени газоочистки.

Имевшиеся до настоящего времени смесительные теплообменники аппараты имели значительные габаритные размеры, большую металлоёмкость и, следовательно, большую себестоимость. Кроме того, некоторые утилизаторы теплоты ПВС для увеличения интенсивности процессов тепло – и массообмена имели вращающиеся разбрызгивающие устройства, что существенно усложняло конструкцию и обслуживание установки, а также снижало её надёжность.

С целью получения математического описания гидродинамики и теплообмена в аппаратах типа ВМФА была разработана физическая модель процессов переноса в таком аппарате. Получена критериальная зависимость для расчета процесса теплообмена в виде

$$Km_v = A \cdot Re^b \cdot Bm_v^c \cdot K_1 \cdot K_2. \quad (26)$$

где Re – число Рейнольдса; Bm_v – число тепловых эквивалентов; K_1 и K_2 – коэффициенты, соответственно учитывающие кратность расхода – K^* (т.е. соотношения восходящего и нисходящего потоков газа) и отношение расхода жидкостей для нисходящего и восходящего потоков газа.

На основании проведенных исследований были разработаны конструкции опытно - промышленных образцов вихревых многофункциональных аппаратов с регулируемой гидродинамикой для утилизации теплоты и очистки выбросного воздуха от пыли и некоторых газов, предназначенных для различных типовых условий их работы, а также инженерные методы их расчета [21-27, 51-55]. Расчеты показывают, что коэффициент теплообмена в многофункциональных аппаратах на порядок выше чем в обычных скрубберах. Теоретические и экспериментальные исследования в области создания оборудования для утилизации теплоты приточно-вытяжных систем (ПВС) позволили сделать вывод о перспективности использования в этих целях вихревого многофункционального аппарата (ВМФА) на базе аппарата со встречными закрученными потоками (ВЗП). В аппарате ВМФА обеспечиваются высокие скорости потока газа (5-25 м/с) без снижения эффективности улавливания влаги. Одним из основных преимуществ вихревого аппарата является наличие в рабочем объеме аппарата высокоразвитой поверхности теплообмена, включающей в себя капельную, пленочную и пенную поверхности раздела фаз [1-4]. Высокие относительные скорости движения фаз и высокоразвитые поверхности раздела фаз обеспечили высокую эффективность аппаратов. Коэффициент теплообмена аппарата на порядок выше, чем в известных промышленных аппаратах, используемых для тех же целей. Это позволило получить требуемый эффект утилизации теплоты при минимальных габаритных размерах и металлоёмкости.

Подавляющее большинство течений в природе и технике являются вихревыми, в которых малые элементы (частицы) газа или жидкости перемещаются не только поступательно, но и вращаются вокруг мгновенной оси. Закрученные потоки в технике формируются и поддерживаются за счет конструкции каналов и камер, входов и выходов из них. Например, в циклонах для пылеочистки и гидроциклонах для разделения суспензий.

Вихревой эффект расслоения в трубе расширяющегося закрученного высокоскоростного потока газа на «холодный» в центральной части и на «горячий» на периферии был открыт французским инженером Ж.Ж. Ранком. В настоящее время вихревой эффект широко используется не только для разделения газов на холодный и горячий потоки (термотрансформаторы), но и для вакуумирования (вакуум-насосы), как осушители, сепараторы, элементы контрольно-измерительных приборов и т.д. Существенный недостаток вихревого эффекта – относительно низкий КПД.

Вихревая труба цилиндрической формы имеет два выхода. Вход газа в вихревую трубу реализуется обычно с помощью одного или двух сопел. На рисунке 6 изображен вариант с одним соплом прямоугольного сечения. При втекании газа при повышенном давлении в сопло вихревой трубы образуется интенсивный закрученный поток. Приосевые слои газа (охлажденные) вытекают через диафрагму, а периферийные (подогретые) – через дроссель. Расходы потоков регулируются дросселем, который меняет величину выходного сечения. Эффекты охлаждения и подогрева оцениваются по разности полных температур на входе и выходах вихревой трубы.

Система уравнений в безразмерных переменных имеет вид:

$$\left. \begin{aligned}
 & \frac{\partial V_r}{\partial t} + V_r \frac{\partial V_r}{\partial r} + V_z \frac{\partial V_r}{\partial z} - \frac{V_\varphi^2}{r} = -\frac{1}{\rho \gamma^2 M^2} \frac{\partial(\rho T)}{\partial r} + \frac{1}{\rho Re} \left(\frac{1}{3} \frac{\partial}{\partial r} (\mu \operatorname{div} V) + \frac{\partial}{\partial z} \left(\mu \frac{\partial V_r}{\partial z} \right) \right. \\
 & \quad \left. + \frac{\partial}{\partial r} \left(\mu \frac{\partial V_r}{\partial r} \right) + \frac{\partial}{\partial z} \left(\mu \frac{\partial V_z}{\partial r} \right) - \frac{\partial}{\partial r} \left(\mu \frac{\partial V_z}{\partial z} \right) + \frac{\mu}{r} \left(\frac{\partial V_r}{\partial r} - \frac{V_r}{r} \right) - \frac{\partial \mu}{\partial r} \frac{V_r}{r} \right), \\
 & \frac{\partial V_\varphi}{\partial t} + V_r \frac{\partial V_\varphi}{\partial r} + V_z \frac{\partial V_\varphi}{\partial z} + \frac{V_\varphi V_r}{r} = \frac{1}{\rho Re} \left(\frac{\partial}{\partial z} \left(\mu \frac{\partial V_\varphi}{\partial z} \right) + \frac{\partial}{\partial r} \left(\mu \frac{\partial V_\varphi}{\partial r} \right) - \frac{1}{r} \frac{\partial}{\partial r} (\mu V_\varphi) \right), \\
 & \frac{\partial V_z}{\partial t} + V_r \frac{\partial V_z}{\partial r} + V_z \frac{\partial V_z}{\partial z} = -\frac{1}{\rho \gamma^2 M^2} \frac{\partial(\rho T)}{\partial z} + \frac{1}{\rho Re} \left(\frac{1}{3} \frac{\partial}{\partial z} (\mu \operatorname{div} V) + \frac{\partial}{\partial z} \left(\mu \frac{\partial V_z}{\partial z} \right) \right. \\
 & \quad \left. + \frac{\partial}{\partial r} \left(\mu \frac{\partial V_z}{\partial r} \right) + \frac{\partial}{\partial r} \left(\mu \frac{\partial V_r}{\partial z} \right) - \frac{\partial}{\partial z} \left(\mu \frac{\partial V_r}{\partial r} \right) + \frac{\mu}{z} \frac{\partial V_z}{\partial r} - \frac{\partial \mu}{\partial z} \frac{V_r}{r} \right), \\
 & \frac{\partial \rho}{\partial t} + \frac{1}{r} \frac{\partial}{\partial r} (\rho V_r) + \frac{\partial(\rho V_z)}{\partial z} = 0, \\
 & \rho C_v \left(\frac{\partial T}{\partial t} + V_r \frac{\partial T}{\partial r} + V_z \frac{\partial T}{\partial z} \right) = \frac{\gamma_0}{Re Pr} \operatorname{div}(\lambda \cdot \nabla T) + \frac{M^2}{Re} \gamma (\gamma - 1) \mu \Phi, \\
 & \Phi = 2 \left[\left(\frac{\partial V_r}{\partial r} \right)^2 + \left(\frac{V_r}{r} \right)^2 + \left(\frac{\partial V_z}{\partial z} \right)^2 \right] + \left(\frac{\partial V_r}{\partial z} + \frac{\partial V_z}{\partial r} \right)^2 + \left(\frac{\partial V_\varphi}{\partial r} - \frac{V_\varphi}{r} \right)^2 - \frac{2}{3} (\operatorname{div} V)^2
 \end{aligned} \right. \quad (27)$$

Система не содержит давления. Для его вычисления используется соотношение, полученное из уравнения состояния в безразмерном виде. Решение задачи зависит от граничных условий и геометрических параметров расчётной области. Кроме того, решение задачи зависит от параметров, входящих в граничные условия на входе и выходах вихревой трубки.

По данным Коновалова-Орлова-Гатаповой, наиболее привлекательными энергетически являются процессы и устройства, в которых используются оба потока: холодный и горячий.

Соответственно, разработаны конструкции комбинированных холодильно-нагревательных устройств, термостатов и пр. Иногда горячий поток используется не только для нагрева, но и для эжекции. Так в процессах сублимационной сушки сначала может потребоваться холод для замораживания продукта, а затем нужен подвод тепла для возгонки льда. Иногда требуется охладить высушенный материал. Разрабатываются различные варианты «осциллирующей» сушки, с чередованием разных температур и других условий сушки ("Intermittent drying"). Например, при сушке зерна циклическая смена сушильного агента с горячего на холодный и обратно положительно сказывается на всхожести семян. Однако для химических технологий, в большинстве случаев, характерны более высокие температуры сушки и более высокие производительности сушилок. Температуры могут достигать 140...220°C и выше, а производительность по испаряемой влаге – до 2...25 т/ч. При этом расходы воздуха на конвективную сушку могут достигать десятки тысяч кубометров в час.

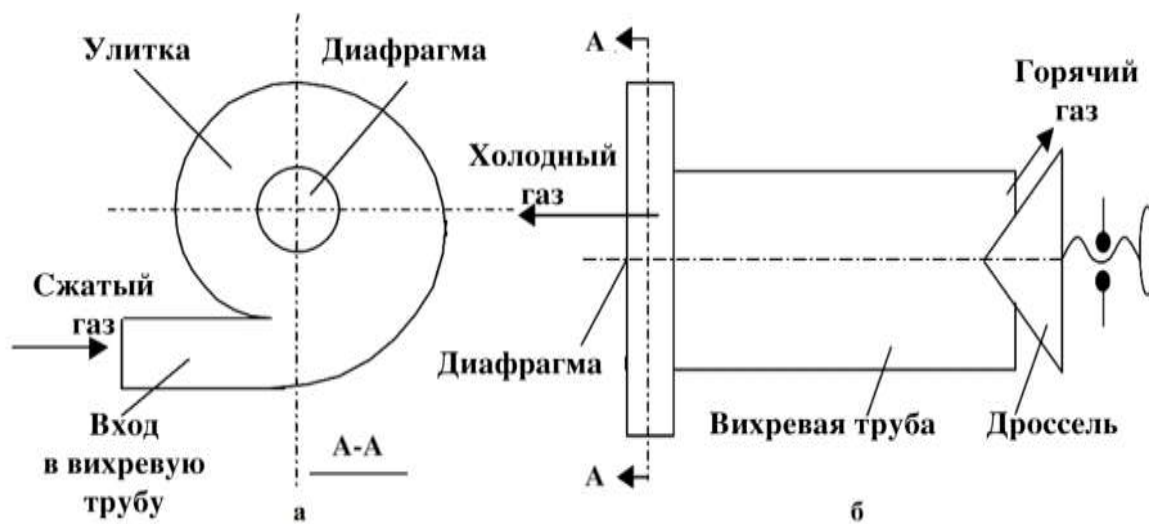


Рисунок 6. Схема вихревой трубы: а – вид с торца, б – вид сбоку

Особо высокие температуры встречаются при использовании сушки топочными газами при проведении высокотемпературной термообработки – до 500...600°C на входе и около 200...250°C на выходе. В технике пылеочистки и сушки широко известны аппараты со встречными закрученными потоками (ВЗП), разработанные в России Б.С. Сажиним с сотрудниками. В них периферийный и центральный потоки подаются и закручиваются отдельно, сверху и снизу. Камеры достигают двухметровых диаметров. Используются обычные вентиляторы. Эффект температурного расслоения в камерах ВЗП невелик, в сушилках ВЗП для подогрева воздуха применяются отдельные калориферы. Можно также отметить конвективную сопловую сушилку для тканей с воздушным инжектором и вихревой трубой Т.Н. Бирюковой (рисунок 7). По её данным, давление свежего воздуха для струйного компрессора изменялось в пределах 0,12...0,35 МПа (подача из сети сжатого воздуха). При диаметре вихревой трубы 100 мм температуры циркулирующего воздуха составляли на выходе из сушилки - 140°C, после вихревой трубы - 150...188 °C, а в барабанной машине - от 75 до 90... 130 °C. Холодный поток предлагается использовать для охлаждения ткани после сушилки. Разработку Л.А. Тарасовой (Комбинированная система охлаждения, нагрева, очистки воздуха от пыли и осушки (КСОНО) на базе вихревой трубы низкого напора) (рисунок 8), по её данным, можно использовать для охлаждения промышленной электроники, создания воздушных завес и вентиляции тупиковых забоев, охлаждения песка в литейном производстве, во временных зернохранилищах, для охлаждения рабочих зон в кабинах и малотоннажной перевозки фруктов и овощей и т.п. на транспорте, а также в производстве полиэтиленовой пленки. Эксперименты Л.А. Тарасовой проводились на малой вихревой трубе диаметром 6 мм, длиной 120 мм, при напоре до 0,18 МПа.

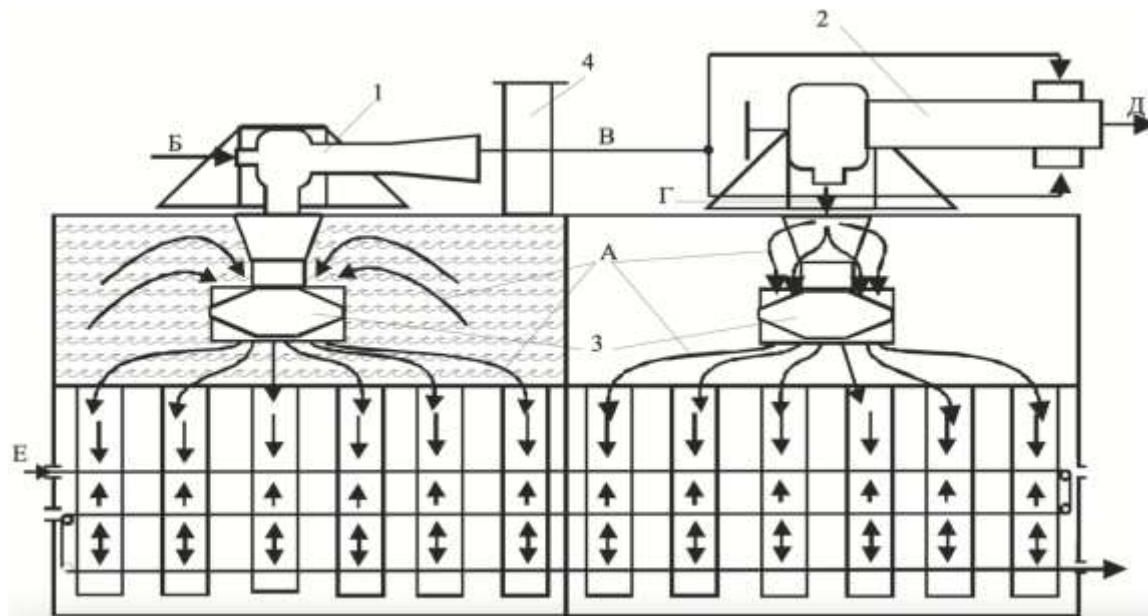


Рисунок 7. Схема конвективно-сопловой тканевой сушилки с воздушным инжектором и вихревой трубой: 1 - струйный компрессор; 2 - вихревая камера; 3 - циркуляционный вентилятор; 4 - вытяжная труба; А - сушильный агент; Б - сжатый воздух, В - сжатый поток из струйного компрессора; Г - горячий поток из вихревой камеры; Д - холодный поток из вихревой камеры; Е - ткань.

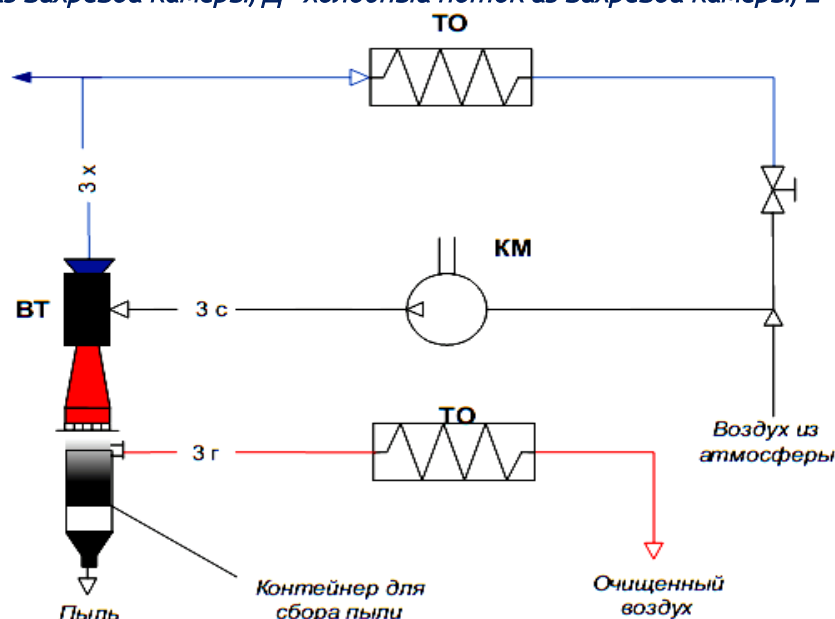


Рисунок 8. Принципиальная схема КСОНО воздуха на базе вихревого аппарата Л.А. Тарасовой: ВТ - вихревая труба; КМ - воздушный компрессор; ТО - теплообменник;

3 с - сжатый воздух; 3 г - горячий поток воздуха; 3 х - охлажденный поток воздуха

В настоящей статье нашли отражение лишь выборочные моменты проведенного комплекса капитальных научных исследований. Говоря в целом о проделанной работе (применительно к самому энергозатратному промышленному процессу - сушке), надо выделить ряд положений. Главное внимание уделено систематизации достигнутых автором (совместно с Б.С. Сажиным, сотрудниками и учениками) результатов и изложению научных основ выбора эффективных сушильных аппаратов и установок, включающих вспомогательное оборудование. Рассмотрены вопросы энергоемкости и рационального аппаратно-технологического оформления процесса сушки на примере дисперсных и диспергируемых материалов. Выбор оптимального оборудования для технологических процессов (включая теплогенераторы (калориферы, топки и др.), питатели-дозаторы, загрузочно-разгрузочное оборудование тяго-дутьевое оборудование и систему пылегазоочистки) в соответствии с разработанной стратегией не требует

экспериментального исследования самого процесса, а определяется исходя из технологической задачи и экспресс анализов материалов как объектов обработки.

Разработанная стратегия может быть использована при выборе оптимального оборудования для ряда других технологических процессов (грануляции, в том числе получения непылящих выпускных форм, например, красителей; промывки, в том числе рулонных материалов, например, тканей в текстильной промышленности и др.). Представлен инженерный расчет типовых сушилок взвешенного слоя с эффективными гидродинамическими режимами. С нашей точки зрения, акцент современных исследователей сместился в сторону решения вопросов моделирования и алгоритмизации расчётных процедур. Компьютеризация открыла совершенно новые возможности для решения инженерных задач. Но и сегодня главной в области прикладной науки именно инженерной функцией является грамотная постановка задачи. Доведение «частотокола» математических формул с сохранением физического смысла описываемых явлений до уровня инженерного расчёта (когда потребность в компьютере ограничивается возможностями продвинутого калькулятора) позволяет в процессе расчёта анализировать достоверность результатов на каждом этапе. Пренебрежение молодых исследователей к процессу упрощения формул до уровня калькулирования объясняется большой трудоёмкостью такой работы и высокими профессиональными требованиями к исполнителю подобной задачи (в частности необходим реальный производственный внедренческий опыт). Неопытному (в части производственных реалий) исследователю представляется эффективным (относительно простым и быстрым) решение задачи «в лоб» - компьютерный расчёт (с использованием вполне ординарных и доступных проблемно-ориентированных расчётных оболочек или пакетов прикладных программ). Следует всегда иметь в виду, что человечество даже вышло в космос «на логарифмической линейке», а конкретные прикладные исследовательские задачи заведомо проще. Доведение описания сложных процессов до уровня инженерного расчёта гарантирует существенное упрощение проектного расчёта аппаратуры и снижение нагрузки на инженерный «шеф-монтаж» и пуско-наладочные работы при промышленном внедрении.

В 1983 году Генеральная Ассамблея ООН констатировала, что экологические проблемы носят глобальный характер и выразила озабоченность «по поводу быстрого ухудшения состояния окружающей среды, человека и природных ресурсов, и последствий ухудшения экономического и социального развития». Для координации усилий по разработке и реализации концепции устойчивого развития была создана Всемирная комиссия по окружающей среде и развитию (WCED). Комиссия предложила наиболее цитируемое определение устойчивого развития: «удовлетворение потребностей нынешнего поколения, без ущерба для возможности будущих поколений удовлетворять свои собственные потребности». Устойчивое развитие объединяет экономический прогресс, социальную справедливость и охрану окружающей среды, то есть способствует долгосрочному экономическому росту за счет сохранения природных ресурсов, поощрения инноваций в области зеленых технологий, создания новых рабочих мест и обеспечения экономической стабильности.

Нам представляется, что в основе устойчивого развития лежат два взаимоисключающих понятия: с одной стороны, удовлетворение основных, наиболее важных, жизнеобеспечивающих потребностей человечества; с другой – самоограничение человечества в части своих потребностей, исходя из возможностей окружающей природной среды их удовлетворить. Причём, реализация устойчивого развития требует самых серьёзных финансовых затрат, необходимых для внедрения устойчивых практик (например, «зелёной» инфраструктуры и возобновляемой энергетики). Из трёх аспектов устойчивого развития (экономический, социальный, экологический) остановимся подробнее на проблеме снижения биоущерба. Промышленное производство наносит серьёзный вред экологии. Страны мира (193 страны) в 2015 году поддержали Повестку ООН устойчивого развития до 2030 года, обязавшись применять самые решительные меры в части сохранения экологии и минимизации биоущерба.

Существующая техносфера создавалась для удовлетворения всё возрастающих потребностей человечества [42-55]. В этой парадигме хозяйствования сопутствующий биоущерб «выносится за скобки» и воспринимается неизбежным последствием. Нам представляется, что одновременно демонтировать существующие производства (по определению загрязняющие биосферу) невозможно. Следовательно, можно говорить лишь об эволюции существующей природообразовательной техносферы в новую экологически безвредную и технологически совершенную техносферу. То есть необходим протяжённый во

времени период поэтапной замены современного промышленного оборудования, требующий гигантских финансовых вложений.

Учитывая, что мероприятия Повестки ООН - 2030 по проблеме устойчивого развития весьма далеки до завершения, а до дедлайна осталось лишь около 5 лет, принятая всеми членами Повестка ООН воспринимается (по крайней мере, в части создания природоподобной техносферы) скорее, как некая декларация о намерениях, нежели дорожная карта усилий, ведущих к принятой цели. К примеру, в России значительная часть городов и посёлков городского типа изначально создавалась как инфраструктура градообразующего промышленного предприятия. Значит, непродуманные действия в отношении таких предприятий могут пагубно сказаться на социальной сфере (которая определяет суть значительного числа глобальных целей устойчивого развития (ЦУР) составляющих Повестку ООН-2030). Численность постоянного населения Российской Федерации по состоянию на 1 января 2023 г. составляет 146,4 млн человек (девятое место в мире). По своей территории Российская Федерация (17, 125 млн. км²) занимает первое место в мире (идущие следом Канада, США и Китай имеют территорию до 10 млн. км²).

В порядке частного мнения, поделимся опасением, что несбалансированные и весьма финансово затратные действия по срочному и всеобщему переходу на природоподобные технологии могут усилить имеющиеся последствия мирового финансового кризиса (эти последствия уже проявились эскалацией напряжения в ряде регионов мира). В рамках Повестки-2030 предлагается, не больше и ни меньше, сменить уклад хозяйствования с природопреобразовательного на природоподобный. Понятно, что это желание должно быть подкреплено (кроме политической воли государств-членов ООН) формированием международного фонда под эгидой ООН с филиалами в странах «преобразовательного пула». Однако, в ближайшей перспективе возможностей даже для формирования рабочих организационных структур не просматривается (Повесткой-2030 занимаются сотрудники Департамента ООН по экономическим и социальным вопросам, деятельность которых ограничивается посильным содействием и сбором информации). Финансирование сверхамбициозной программы мероприятий (а значит, и контроль за исполнением) делегировано государствам-участникам и международным инвесторам. В порядке ремарки отметим, что складывается впечатление, что абсолютное большинство стран-членов ООН изначально не верило и сейчас не верит в реальную возможность выполнения Повестки ООН по устойчивому развитию, по крайней мере, в принятые сроки.

По данным Департамента ООН по экономическим и социальным вопросам [56], ежегодные потребности в инвестициях для достижения 17 (единогласно принятых голосованием Повестки-2030) глобальных Целей Устойчивого Развития (ЦУР) в области устойчивого развития во всех секторах оцениваются в 5-7 триллионов долларов США. Нынешние объёмы финансирования далеки от требуемого, хотя профильные эксперты ООН, оценивая глобальные финансовые активы в более чем 200 триллионов долларов США, утверждают, что финансовые ресурсы имеются. Однако большая их часть не направляется на цели устойчивого развития в тех масштабах и теми темпами, которые необходимы для достижения ЦУР и целей Парижского соглашения об изменении климата [56].

По заключению Департамента ООН по экономическим и социальным вопросам [56], интерес к Целям в области устойчивого развития и инвестиции в них растут, при этом инвестирование в Цели приносит экономическую выгоду. Достижение ЦУР способно открыть рыночные возможности, эквивалентные 12 триллионов долларов США, и обеспечить к 2030 году создание 380 миллионов новых рабочих мест.

Анализ доступной информации показывает, что трудно ожидать серьёзного роста инвестиций в ЦУР по причине устойчивого дефицита государственных бюджетов ведущей семёрки стран мира (Таблица 1 [57]).

Таблица 1.

Государственный (не консолидированный) бюджет (по данным Международного валютного фонда [57]) ведущей семерки стран мира, ранжированных по показателю доходов бюджета

№	Страна	Доходы, (млн \$)	Расходы, (млн \$)	Дефицит/Профицит, (млн \$)	Год
1	США	5 036 000	6 883 000	-1 847 000	2024
2	Китай	3 622 313	5 388 814	-1 788 501	2020
3	Германия	1 729 224	2 038 247	-309 203	2020
4	Япония	1 666 454	2 362 676	-696 222	2020
5	Франция	1 334 944	1 609 710	-274 666	2020
6	Великобритания	966 407	1 400 776	-434 369	2020
7	Италия	863 785	1 103 721	-239 936	2020

В России указом Президента РФ №474 от 21 июля 2020 года утверждены национальные цели развития страны на период до 2030 года, которые соответствуют ЦУР Повестки ООН по устойчивому развитию до 2030 года, в частности, предусматривают переход на экологически чистые технологии.

Промышленность является крупной отраслью государственной экономики России. Так ещё в 2016 году доля занятого в промышленности населения составляла 27,6%, а доля промышленности в ВВП РФ – 32,4%. Число государственных компаний в промышленности России планомерно сокращается (Таблица 2) [58].

Таблица 2.

Число государственных компаний в России (2020-2025 годы (по данным [58])).

Год	2020	2021	2022	2023	2024 (прогноз)	2025 (прогноз)
Число госкомпаний	1465	1319	1187	1068	867	661

Доля химической отрасли в структуре ВВП России снижается. Так она в 2006 году составляла около 6 % (в структуре экспорта — около 5 %), и в отрасли было сосредоточено почти 7 % основных фондов промышленности. А уже в 2019 году доля химической промышленности в ВВП РФ снизилась до 1,1 %, а доля выручки химического комплекса в общей выручке реального сектора экономики составила лишь около 2,6 %.

По мнению куратора химической промышленности России статс-секретаря – замминистра промышленности и торговли В.Л. Евтухова (в июне 2024 года назначенного начальником управления администрации президента РФ по государственной политике в сфере оборонно-промышленного комплекса) инвестиции в химическую отрасль растут, однако, анализ им же представленных данных (Таблица 3) [58; 59] такого впечатления не оставляет.

Таблица 3.

Общий объём инвестиций в химическую отрасль РФ (пояснения в тексте)

Годы	2008	2016	2017	2018	Всего в 2014-2019
Объём инвестиций в химическую отрасль, млрд руб. [58]	140	380,5	430	503,1	2000
Курс доллара в рублях [59]	24,86	67,00	58,34	62,74	38,48 (2014); 64,72 (2019)

В 2020 году в рамках реализации Стратегии развития химической и нефтехимической промышленности на период до 2030 года и Плана мероприятий по импортозамещению в отрасли химической промышленности планируется запущено 16 инвестиционных проектов с общим объёмом инвестиций более 14 млрд руб.

В 2023 году химическая промышленность РФ объединяла более 1000 крупных и средних предприятий [58].

Два самых крупных направления химической промышленности — производство полимеров и выпуск минеральных удобрений. По данным Росстата, производство пластмасс в России в первом квартале 2019 увеличилось на 3,1 % до 4,3 млн тонн, минудобрений — на 2 % до 12 млн тонн.

В 2024 г. ожидаемый экспорт химической промышленности должен составить 34 млрд долл. в год.

Можно отметить, что за последние 5 лет с 2019 года наблюдается устойчивый рост химической промышленности России. Тем сложнее проводить мероприятия, связанные с выполнением Повестки ООН-2033, особенно в период действия целого ряда санкций в

отношении России и очевидного самоустранения мирового сообщества от финансовой поддержки России. Надо констатировать, что, с разрушением централизованной системы отраслевых научно-исследовательских институтов и специализированных конструкторских бюро, реальным исполнителем и координатором работ по снижению промышленного биоущерба в России может стать Российская инженерная академия (РИА) во главе с президентом Б.В. Гусевым, членом РАН, профессором, сопредседателем Высшего инженерного совета РФ, лауреатом семи государственных премий. и премий Правительства СССР и РФ в области науки и техники.

Нами в рамках авторитетной международной научной школы Б.С. Сажина достигнуты определённые успехи в части минимизации биоущерба при проведении процесса сушки - наиболее неблагоприятного в экологическом отношении (в химической и смежных отраслях промышленности) за счёт значительных тепловых и пылевых выбросов в атмосферу [1-8; 29, 43-55].

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