



НАУЧНАЯ АРТЕЛЬ
АКАДЕМИЧЕСКОЕ ИЗДАТЕЛЬСТВО

16+

ISSN (p) 2712-9489

ISSN (e) 2542-1026

№ 3/2026

**НАУЧНЫЙ ЖУРНАЛ
«COGNITIO RERUM»**

Москва
2026

НАУЧНЫЙ ЖУРНАЛ «COGNITIO RERUM»

Учредитель:
Общество с ограниченной ответственностью «Издательство
«Научная артель»

ISSN (p) 2412-9489
ISSN (e) 2542-1026

Периодичность: 1 раз в месяц

Журнал размещается в Научной электронной библиотеке
elibrary.ru по договору №511-08/2015 от 06.08.2015

Журнал размещен в международном каталоге
периодических изданий Ulrich's Periodicals Directory.

Верстка: Мартиросян О.В.
Редактор/корректор: Мартиросян Г.В.

Учредитель, издатель и редакция
научного журнала «COGNITIO RERUM»
Академическое издательство «Научная артель»:
+7 (495) 514 80 82
<https://sciartel.ru>
info@sciartel.ru
450057, ул. Салавата 15

Подписано в печать 16.03.2026 г.
Формат 60x90/8
Усл. печ. л. 09.30
Тираж 500.

Отпечатано
в редакционно-издательском отделе академического издательства
«Научная артель»
<https://sciartel.ru>
info@sciartel.ru
+7 (495) 514 80 82

Цена свободная. Распространяется по подписке.

Все статьи проходят экспертную проверку. Точка зрения редакции не
всегда совпадает с точкой зрения авторов публикуемых статей.

Авторы статей несут полную ответственность за содержание статей и за
сам факт их публикации. Редакция не несет ответственности перед
авторами и/или третьими лицами за возможный ущерб, вызванный
публикацией статьи.

При использовании и заимствовании материалов, опубликованных в
научном журнале, ссылка на журнал обязательна

Главный редактор:

Сукиасян Асатур Альбертович, к.э.н.

Редакционный совет:

Абидова Гулмира Шухратовна, д.т.н.

Авазов Сардоржон Эркин угли, д.с.-х.н.

Агафонов Юрий Алексеевич, д.м.н.

Алейникова Елена Владимировна, д.гос.упр.

Алиев Закир Гусейн оглы, д.фил.агр.н.

Ашрапов Баходурджон Пулотович, к.фил.н.

Бабаян Анжела Владиславовна, д.пед.н.

Баишева Зилия Вагизовна, д.фил.н.

Булатова Айсылу Ильдаровна, к.соц.н.

Бурак Леонид Чеславович, к.т.н., PhD

Ванесян Ашот Саркисович, д.м.н.

Васильев Федор Петрович, д.ю.н., член РАЮН

Вельчинская Елена Васильевна, д.фарм.н.

Виневская Анна Вячеславовна, к.пед.н.

Габрус Андрей Александрович, к.э.н.

Галимова Гузалия Абкадировна, к.э.н.

Гетманская Елена Валентиновна, д.пед.н.

Гимранова Гузель Хамидуловна, к.э.н.

Григорьев Михаил Федосеевич, к.с.-х.н.

Грузинская Екатерина Игоревна, к.ю.н.

Гулиев Игбал Адилевич, к.э.н.

Датий Алексей Васильевич, д.м.н.

Долгов Дмитрий Иванович, к.э.н.

Дусматов Абдурахим Дусматович, к. т. н.

Ежкова Нина Сергеевна, д.пед.н.

Екшикеев Тагер Кадырович, к.э.н.

Епхиева Марина Константиновна, к.пед.н., проф. РАЕ

Ефременко Евгений Сергеевич, к.м.н.

Закиров Мунавир Закиевич, к.т.н.

Зарипов Хусан Баходирович, PhD.

Иванова Нионила Ивановна, д.с.-х.н.

Калужина Светлана Анатольевна, д.х.н.

Канарейкин Александр Иванович, к.т.н.

Касимова Дилара Фаритовна, к.э.н.

Кирикосян Сусана Арсеновна, к.ю.н.

Киркимбаева Жумагуль Слямбековна, д.вет.н.

Кленина Елена Анатольевна, к.филос.н.

Клещина Марина Геннадьевна, к.э.н.,

Козлов Юрий Павлович, д.б.н., заслуженный эколог РФ

Кондрашин Андрей Борисович, д.э.н.

Конопацкова Ольга Михайловна, д.м.н.

Куликова Татьяна Ивановна, к.псих.н.

Курбанаева Лилия Хамматовна, к.э.н.

Курманова Лилия Рашидовна, д.э.н.

Ларионов Максим Викторович, д.б.н.

Мальшкина Елена Владимировна, к.и. н.

Маркова Надежда Григорьевна, д.пед.н.

Мещерякова Алла Брониславовна, к.э.н.

Мухамадеева Зинфира Фанисовна, к.соц.н.

Мухамедова Гулчехра Рихсибаевна, к.пед.н.

Набиев Тухтамурод Сахобович, д.т.н.

Песков Аркадий Евгеньевич, к.полит.н.

Половения Сергей Иванович, к.т.н.

Пономарева Лариса Николаевна, к.э.н.

Почивалов Александр Владимирович, д.м.н.

Прошин Иван Александрович, д.т.н.

Саттарова Рано Кадыровна, к.биол.н.

Сафина Зилия Забировна, к.э.н.

Симонович Николай Евгеньевич, д.псих. н., академик РАЕН

Сирик Марина Сергеевна, к.ю.н.

Смирнов Павел Геннадьевич, к.пед.н.

Старцев Андрей Васильевич, д.т.н.

Танаева Замфира Рафисовна, д.пед.н.

Терзиев Венелин Кръстев, д.э.н., член РАЕ

Умаров Бехзод Тургунпулатович, д.т.н.

Хайров Расим Золимхон углы, к.пед.н.

Хамзаев Иномжон Хамзаевич, к. т. н.

Хасанов Сайдинаби Сайдвалиевич, д.с.-х.н.

Чернышев Андрей Валентинович, д.э.н.

Чиладзе Георгий Бидзиневич, д.э.н., д.ю.н., член РАЕ

Шилкина Елена Леонидовна, д.соц.н.

Шкирмонтов Александр Прокопьевич, д.т.н., член-РАЕ

Шляхов Станислав Михайлович, д.физ.-мат.н.

Шошин Сергей Владимирович, к.ю.н.

Юсупов Рахимьян Галимьянович, д.и. н.

Яковишина Татьяна Федоровна, д.т.н.

Янгиров Азат Вазирович, д.э.н.

Яруллин Рауль Рафаэлович, д.э.н., член РАЕ

СОДЕРЖАНИЕ

ФИЗИКА

- Ponomarev D.** 7
ANTIGRAVITY IN THE FRAMEWORK OF THE GENERAL THEORY OF RELATIVITY

МАТЕМАТИКА

- Orusov G., Babayev A., Yoldashov G., Kakamyradova O.** 15
THE IMPORTANCE OF MATHEMATICS IN MODERN SCIENCE AND TECHNOLOGY

КУЛЬТУРОЛОГИЯ

- Сапармурадова Г.Б., Сапармурадова Г.Б.** 18
ПОРТРЕТНЫЕ ПРОИЗВЕДЕНИЯ ЙЕДИНАЗАРА МАДАТОВА

ТЕХНИКА И ТЕХНОЛОГИЯ

- Agasenov D., Gurbanmyradov A., Ekayev A.** 22
COMPUTER GRAPHICS: TECHNOLOGICAL ADVANCEMENTS AND APPLICATIONS IN MODERN SOCIETY

- Babayev A., Amanov M., Durdyeva O.** 24
ARTIFICIAL INTELLIGENCE: TRANSFORMING MODERN INFORMATICS AND SOCIETY

- Babayev A., Amanov M., Durdyeva O.** 25
BIG DATA: DRIVING INNOVATION AND DECISION-MAKING IN MODERN INFORMATICS

- Gulamova G., Hanov T.** 27
CYBERSECURITY AND DATA PROTECTION IN THE AGE OF INFORMATION TECHNOLOGY

- Gurbanmyradova U., Annaberdiyeva M., Yalkabova H.** 29
THE POSSIBILITIES OF THE DIGITAL ECONOMY

- Gurbanmyradova U., Tillayeva A., Pollabayeva O.** 30
THE FOUNDATION OF THE DIGITAL AGE

- Halbayeva J., Yagmyrov M., Gurbanmyradova O.** 32
THE ROLE OF INFORMATICS IN MODERN SOCIETY AND TECHNOLOGICAL DEVELOPMENT

СЕЛЬСКОЕ ХОЗЯЙСТВО

- Bashimov A., Kakabayev T., Dolayeva S.** 35
AKHAL-TEKE HORSES: CULTURAL ICONS OF TURKMENISTAN

- Charyberdiyev K., Berdinazarov M., Gylychmyradova O.** 36
ADVANCEMENTS IN VETERINARY MEDICINE: DIAGNOSTICS, TREATMENT, AND ANIMAL WELFARE

- Gurbanmyradova U., Tillayeva A., Samykova G.** 38
AKHALTEKE HORSES AND HORSE BREEDING: MORPHOLOGICAL, GENETIC, AND TECHNOLOGICAL PERSPECTIVES

- Gurbanmyradova U., Annaberdiyeva M., Meredova A.** 40
AKHALTEKE HORSES IN INTERNATIONAL EQUESTRIAN SPORTS AND BREEDING PROGRAMS

ЭКОНОМИКА И УПРАВЛЕНИЕ

- Doan Thi Nhiem, Tran Thi Dieu** 43
THE DEVELOPMENT OF THE DROPSHIPPING MODEL IN SUPPLY CHAINS

ФИЛОЛОГИЯ

- Altyyeva A., Chayyrov A., Yoldashov G., Kakabayeva O.** 51
THE TURKMEN LANGUAGE: CULTURAL HERITAGE AND MODERN DEVELOPMENT

- Nguyen Thi Cuc** 52
PRAGMATIC EQUIVALENCE IN ENGLISH-VIETNAMESE TRANSLATION: A QUALITATIVE ANALYSIS OF CULTURAL, INTERPERSONAL, AND IMPLICATURE SHIFTS

ПЕДАГОГИКА

- Ahmedov S., Bayramova B., Ojardurdyev M., Bahramova N.** 58
THE EDUCATIONAL ENVIRONMENT

- Charyberdiyev K., Yoldashov G., Jumageldiyeva O.** 59
DUAL APPROACHES IN MODERN EDUCATION: THEORETICAL AND PRACTICAL TEACHING METHODS

- Chayyrov A., Amanov M., Bayramgulyyeva O.** 61
DUAL TEACHING APPROACHES IN STEM EDUCATION: COMBINING THEORY AND PRACTICE

- Мухаммедова З.Р.** 63
ПАТОФИЗИОЛОГИЯ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ

МЕДИЦИНА

- Аннаева О.** 67
INTEGRATED STUDY OF NORMAL AND PATHOLOGICAL PHYSIOLOGY: MECHANISMS AND CLINICAL SIGNIFICANCE

- Аннаева О.** 68
NORMAL AND PATHOLOGICAL PHYSIOLOGY: INSIGHTS INTO FUNCTIONAL AND DISEASE STATES

- Аннаева О.** 70
NORMAL AND PATHOLOGICAL PHYSIOLOGY: PRINCIPLES, DIAGNOSTICS, AND CLINICAL APPLICATIONS

- Тошиева Г., Яйлымова Дж.** 71
НОРМОПЛАСТИЧЕСКИЕ И ГИПЕРПЛАСТИЧЕСКИЕ ИЗМЕНЕНИЯ ШЕЙКИ МАТКИ

- Тошиева Г., Гельдиева Дж.** 73
ПНЕВМОПАТИИ И РЕСПИРАТОРНЫЙ ДИСТРЕСС-СИНДРОМ У НОВОРОЖДЕННЫХ

- Халмедов Б., Сылапова Дж.** 74
МОРФОФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ ДЕЦИДУАЛЬНОЙ ТКАНИ ПРИ НЕРАЗВИВАЮЩЕЙСЯ БЕРЕМЕННОСТИ

ИСКУССТВОВЕДЕНИЕ

Shageldiyeva M.

78

NOWRUZ: CELEBRATING SPRING AND CULTURAL HERITAGE

Головкин К., Сапаров О., Гурбанназарова А.

79

ПРАЗДНИК НОВРУЗ КАК СИМВОЛ ОБНОВЛЕНИЯ И НАЦИОНАЛЬНЫХ ТРАДИЦИЙ



ФИЗИКА

Dmitry Ponomarev V.
Independent researcher
Saint-Petersburg, Russia

ANTIGRAVITY IN THE FRAMEWORK OF THE GENERAL THEORY OF RELATIVITY

Abstract

This article provides a logical sequence for deriving equations describing the antigravity interaction of bodies, as well as a general equation of the gravitational force acting on an extended test object (an element of material matter) with a velocity gradient from another material object and determining the conditions for changing its direction vector (antigravity) within the framework of general relativity.

Keywords:

gravity, antigravity, principle of time extremity, relativism, speed of light.

The description of antigravity as a special case of gravitational interaction and the mechanism of its occurrence (generation) are presented in the works of the relativistic model of antigravity interaction of bodies [1]. The general theory of relativity (GTR) is the generally accepted fundamental theory of gravity, and the classical laws of Newtonian mechanics are derived from its equations in the Newtonian limit. The complete derivation of the general equation of the gravitational force acting on an extended test object (an element of matter) with a velocity gradient from another material object and the determination of the conditions for changing its direction vector (antigravity) according to GTR and its mathematical apparatus are presented in the work "Antigravity as a consequence of the principle of extremality of proper time for a long object with a velocity gradient in general relativity" [2]. This work lays the fundamental theoretical basis for the relativistic model of antigravity interaction between bodies, relying on GTR as the only consistent modern theory of gravity. The articles "The basic equation of antigravity" [3], "The antigravity point" [4], and "The antigravity force" [5] describe antigravity in the Newtonian limit with relativistic corrections.

In this article, we will focus only on the general logical sequence of deriving the equations describing the antigravitational interaction of bodies and present the basic equations of [2].

The derivation of the equations describing the possibility of antigravity is based on the consistent identification of precise relationships between the geometry of space-time, the kinematics of an object in its stationary state, and the resulting force. **The fundamental basis for this derivation is one of the fundamental principles of general relativity, which is the principle of extremality of proper time. According to this principle, a freely moving test particle follows a geodesic, a world line that makes its proper time extremal.** In other words, **the test particle moves towards a region where time flows more slowly.** This corresponds to the idea that **everything in the world tends to move towards the future.** In regions where time flows faster, the future has already passed, while in regions where time flows slower, the future has not yet arrived compared to the first region. Therefore, the region with slower time flow relative to the region with faster time flow **represents the future.** This is where the test particle moves towards, occupying a more "comfortable" position in space-time.

Thus, the derivation of the necessary equations begins with the definition of a physical system and its state: an infinitesimal extended test element of matter in a stable dynamic configuration is considered, radially oriented in a static spherically symmetric mass M field (shown in Figure 1 as a blue line), described by the Schwarzschild metric.

For further work, we introduce the following notation:

M – the mass of the central gravitating body;

dl – the intrinsic length of an infinitesimal extended test element of matter;

1 and 2 – the first and second equipotential surfaces of the gravitational field of a body with mass M ;

G – the gravitational constant;

c – the speed of light in a vacuum;

$r_s = 2 \cdot G \cdot M / c^2$ – the Schwarzschild radius;

$A(r) = 1 - r_s/r$ – the component of the metric tensor responsible for the temporal part of the interval and directly related to gravitational time dilation;

ω – the coordinate angular velocity with which an extended test element of matter moves in a curvilinear motion relative to a body with mass M ;

t, r, ϑ, φ – the Schwarzschild coordinates (coordinate time, radial coordinate, polar and azimuthal angles);

τ – the proper time.

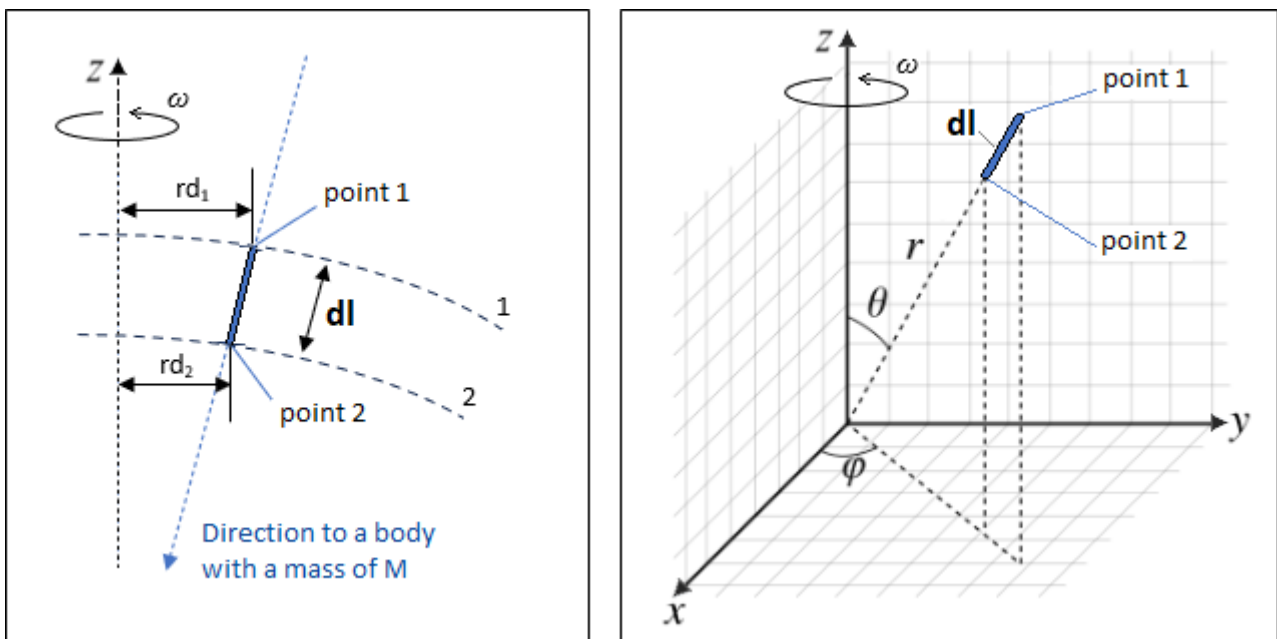


Figure 1 – Schematic two-dimensional (left) and three-dimensional (right) representation of an element of matter of infinitesimal size dl in the Cartesian and spherical coordinate systems at $\omega = 0$

It should be noted that Figure 1 does not depict a body with a mass of M , so the space is not represented as curved. It is assumed that a spherically symmetric body with a mass of M will be located in the center of the depicted coordinate systems, and the space-time will be curved. It is important to note that Figure 1 is a schematic representation and reflects the situation when $\omega = 0$. This is done to provide a visual and schematic representation of how the element of matter is positioned in space (in this case, in a flat space-time), and the direction of ω is indicated to demonstrate the future movement of the element. However, when a body with a mass of M and $\omega > 0$ is present, the space-time will be curved, which will be described mathematically (without a visual graphical representation) in this paper.

Let us add that the word "extended" (when applied to an element of material matter) does not mean any significant value of size, but rather that the presence of any material matter implies at least $dl \rightarrow 0$, i.e., $dl \neq 0$, otherwise (when $dl = 0$) there is simply no material matter. Let us also agree that for brevity, we will refer to such an extended radial test element of material matter as "element" ("extended radial test element of material matter in a stable dynamic state" = "element").

It is necessary to understand that the element under consideration will actually be a component part of a larger object, namely a complex technical structure designed to create a gravitational lift force. This structure is known as an "antigravity wing" and is designed to provide directional movement of matter along a curved, closed trajectory at high speeds, while also maintaining structural integrity under calculated mechanical loads.

The key is to describe the dynamic state: the element is performing a curvilinear motion (in this case, a uniform circular motion, i.e., rotation) relative to the body M , and in its own (comoving) reference frame, the distance between the ends, i.e., the intrinsic length $L_0 = dl$, remains constant. This state does not describe a hypothetical perfectly rigid body, but rather a physically realizable stationary configuration within the framework of general relativity, where all internal stresses and relativistic deformations are balanced.

Therefore, based on the above, it follows that an element in a moving state **is not** the same object as an element in a stationary state.

This physical state, defined in the accompanying system, must be correctly expressed in the global coordinates used to describe the entire system. In the Schwarzschild coordinates, the condition of constant intrinsic length of the element manifests itself as the constancy of the coordinate angular velocity $\omega(t) = d\varphi/dt$ for all points of the element (i.e., $\omega(t) = const$). This correspondence is not an obvious identity, but rather a precise consequence of the metric: in order for the ends of the element, which are located at points with different gravitational potentials, to maintain a constant distance in their rest system, their motion in the coordinates must be synchronized in a specific way. If ω were to depend on t , it would imply the presence of angular acceleration, which would require external moments of force or changes in internal stresses, violating the very property of a stable dynamic state. Therefore, the condition of $\omega = const$ is not an independent postulate; it is derived as a mathematical consequence of the physical properties that describe the state of the object.

The next and most important step is to calculate the local, physically measurable velocities of the element's ends. The physical velocity is determined relative to the momentarily comoving reference frame (MCRF) according to the following rule:

$$v_{physical} = \frac{\text{proper spatial displacement}}{\text{local observer's own time}} \tag{1}$$

For a point at a distance rd from the axis of rotation, the proper azimuthal displacement is $rd \cdot d\varphi$, and the proper time of a stationary observer there is $d\tau = (A(r))^{1/2} \cdot dt$. If we project points 1 and 2 on the z -axis in Figure 1, then in the Schwarzschild metric, $rd(r) = r \cdot \cos(\alpha)$, where: rd – is the radius of rotation of the element point relative to the z -axis, and the angle $\alpha = (\pi/2) - \vartheta$. Thus, $rd = r \cdot \cos(\alpha)$ – is true both in the coordinate and physical sense (for the radius of rotation), and it does not depend on the speed of motion. The physical radius of rotation (locally measured) is equal to $r \cdot \cos(\alpha)$ because in the azimuthal direction, the Schwarzschild metric gives:

$$\sqrt{g_{\phi\phi}} = r \sin \theta = r \cos \alpha \tag{2}$$

Therefore, the physical velocity of the point of the element is:

$$v(r) = r \cdot \omega \cdot \cos \alpha = r_d \cdot \omega \tag{3}$$

Therefore, the local speed is obtained as:

$$v(r) = \frac{r_d \cdot d\varphi}{\sqrt{A(r)} dt} = \frac{r_d \cdot \omega}{\sqrt{A(r)}} = \frac{r \cdot \omega \cdot \cos \alpha}{\sqrt{A(r)}} \tag{4}$$

This formula is the core of the derivation, as it shows that in general relativity, the local velocity is determined not only by the geometric factor r , but also by the relativistic factor $1/(A(r))^{1/2}$, which reflects

the gravitational time dilation at a given point in the field.

A direct analysis of this formula for the ends of the element with radii $r_1 = r + dl/2$ (far) and $r_2 = r - dl/2$ (near) allows us to establish the exact nature of their motion. Since:

$$v_1 = \frac{r_1 \omega \cos \alpha}{\sqrt{A(r_1)}} \quad \text{и} \quad v_2 = \frac{r_2 \omega \cos \alpha}{\sqrt{A(r_2)}}, \quad (5)$$

and the $A(r)$ function increases with radius, the denominator for v_1 is greater than for v_2 . The numerator for v_1 is also greater. Quantitative analysis of the ratio:

$$\frac{v_1}{v_2} = \frac{r_1}{r_2} \cdot \sqrt{\frac{A(r_2)}{A(r_1)}} \quad (6)$$

shows that, while remaining greater than one (i.e., $v_1 > v_2$), it is also less than the purely Newtonian ratio r_1/r_2 . **Thus, the gravitational time dilation does not negate the fact that the far end is moving faster than the near end, but it reduces the difference in their velocities compared to flat space. It is this precisely calculated difference, rather than the simple relationship $v = \omega \cdot r \cdot \cos(\alpha)$, and more importantly, the gradient of Lorentz factors it generates:**

$$\gamma(r) = \frac{1}{\sqrt{1 - \frac{v(r)^2}{c^2}}} \quad (\text{где } \gamma_1 \neq \gamma_2) \quad (7)$$

along the element, they become the primary source of asymmetry, which, within the framework of the Einstein field equations, leads to a qualitatively new effect: antigravity.

Having the exact expressions for $v(r)$ and, therefore, for the 4-velocity U_μ , we can proceed to a rigorous calculation of the force as a measure of deviation from free (geodesic) fall, which is determined by the principle of extremality of proper time. To do this, we use the fundamental equation of geodesic deviation, which is the main tool of general relativity for analyzing the relative acceleration of test masses. This equation involves the radial separation vector ξ_μ , which fixes the geometry of the element, the calculated components of the 4-velocity, which contain $v(r)$ and $\gamma(r)$, and the specific non-zero components of the Riemann curvature tensor for the Schwarzschild metric. Solving this tensor equation yields an expression for the relative 4-acceleration of the ends of the element.

The resulting relative acceleration is then transformed, through the geodesic equation with Christoffel symbols, into the 4-acceleration a_μ of the mass element dm itself. This transformation is a direct application of the principle of extremality of proper time: the calculated 4-acceleration a_μ quantifies how much the actual motion of the element differs from the motion along a local geodesic (free fall). According to the principle of extremality of proper time and its consequence, the geodesic equation of motion, the presence of such a non-zero 4-acceleration means that a force is acting on the element. After algebraic transformations, the radial component ar takes a form that explicitly depends on the square of the velocity v^2 and the square of the Lorentz factor γ^2 . The elementary force acting on the element is given by $dFr = dm \cdot ar$, where dm is the mass of the element.

Since the quantities v and γ in the expression for ar are themselves functions of the radial coordinate ($v(r')$, $\gamma(r')$), the elementary force dFr also varies along the element. Therefore, to find the total force acting on an element of finite length dl , it is necessary to integrate dFr from r_2 to r_1 . It is crucial to use the exact dependence $v(r') = (r' \cdot \omega \cdot \cos(\alpha))/A(r')^{1/2}$, which was derived earlier, at this stage.

After integrating and expanding the result in a series with respect to the small parameter dl/r , we obtain the final formula for the gravitational force F in the Schwarzschild metric (see formula (8)).

Equations (4) – (7) indicate a very important fact: antigravity is only possible when the interacting

material bodies move in a curved path relative to each other. When they move in a straight line relative to each other, antigravity is impossible, because in this case, $u_1 = u_2$.

Thus, **the physical mechanism of gravity or antigravity** is based on the constant competition between two relativistic corrections to the rate of flow of one's own time:

- **Gravitational time dilation** $((A(r))^{1/2})$, which tends to accelerate an extended object towards the center of the field;
- **Kinematic time dilation** $(1/\gamma = (1 - u^2/c^2)^{1/2})$, which is associated with the curved motion of an extended object.

At high speeds, the kinematic correction becomes dominant. For an element of a given object with a velocity gradient ($u_1 > u_2$), the kinematic deceleration is stronger at the far end. This creates an effective gradient of "total time rate" (due to the gravitational and kinematic corrections) along the element, which manifests itself as a resultant force in the geodesic deviation equation. When the critical speed $u > u_{crit}$ is exceeded (see equations (8) and (9)), the contribution of the kinematic deceleration becomes dominant, resulting in a configuration of relative accelerations of the extended object's parts where the resultant force is directed away from the center of the mass M , indicating antigravity.

The final logic of deriving the formula for the gravitational force with the possibility of changing its sign (i.e., with the possibility of antigravity):

- **The principle of extremality of proper time** (geodesics) →
- The definition of a well-established dynamic state with a radial orientation of the element →
- The condition of constant proper length →
- The coordinate condition $\omega = const$ in the Schwarzschild metric →
- The exact formula for the local velocity in MCRF:

$$u(r) = (r \cdot \omega \cdot \cos(\alpha)) / (A(r))^{1/2} \rightarrow$$

- The establishment of the exact gradient of velocities and Lorentz factors:

$$(u_1 > u_2, \gamma_1 \neq \gamma_2) \rightarrow$$

- Substitution into the equation of geodesic deviation and calculation of Christoffel symbols →
- Calculation of the 4-acceleration a_μ as a measure of deviation from the geodesic (**a direct**

consequence of the principle of extremality of proper time) →

- Integration of the elementary force $dFr = dm \cdot ar$ →
- The final formula for the gravitational force F , which demonstrates the possibility of changing the

sign (direction) when $u > u_{crit}$.

Thus, the entire chain of reasoning is a consistent and necessary progression from the fundamental principle and the definition of a specific dynamic configuration to its precise coordinate description in curved spacetime, from there to the calculation of local dynamic quantities taking into account relativistic effects, and finally to the substitution of these quantities into the fundamental equations of general relativity to obtain a quantitative result. The calculated force is the force acting specifically on an element of matter in its stationary moving state with a radial orientation, and it is fundamentally different from the force that would act on the same element of matter in a different configuration. Each step of the reasoning serves to establish the precise quantitative nature of the relationships under the conditions of general relativity, leading to the profound conclusion that the sign of the gravitational force can change when the critical velocity u_{crit} is reached, as a direct consequence of Einstein's equations.

A rigorous derivation of the gravitational force F equation in full general relativity and a simplified derivation of the gravitational force F equation in linearized general relativity based on the above logic are presented in [2], and their detailed examination is beyond the scope of this article. However, we will present the final formulas for the gravitational force F from this work below.

The full formula for the gravitational force F in the Schwarzschild metric is as follows:

$$F = -\frac{GMm}{r^2} \cdot \frac{1}{\sqrt{A(r)}} \cdot \frac{1 - \frac{2v^2}{c^2 A(r)}}{\left(1 - \frac{v^2}{c^2 A(r)}\right)^{3/2}} \left[1 + O\left(\frac{dl^2}{r^2}, \frac{r_s^2}{r^2}\right)\right] \quad (8)$$

The formula for the gravitational force F in the linearized approximation (weak field):

$$F = -\frac{GMm}{r^2} \cdot \frac{1 - 2v^2/c^2}{(1 - v^2/c^2)^{3/2}} + O\left(\frac{dl^2}{r^2}\right) \quad (9)$$

This expression is a limiting case of the full formula when $rs/r \rightarrow 0$, i.e. $A(r) = 1 - rs/r \approx 1$.

The critical speed is the speed at which the gravitational force F changes sign (direction):

- In full GTR:

$$v_{\text{crit}} = \frac{c}{\sqrt{2}} \sqrt{1 - \frac{r_s}{r}} = \frac{c}{\sqrt{2}} \sqrt{A(r)} \quad (10)$$

- In the linearized approximation:

$$v_{\text{crit}} = \frac{c}{\sqrt{2}} = \frac{c\sqrt{2}}{2} \approx 0.707c \quad (11)$$

The paper [2] also provides a description of the key role of a material body that is both a source of gravity and a "point of support" for antigravity (including analogies with the lift of an airplane wing and the movement of a sailboat against the wind), examines all the energy conditions that determine the possibility of effective repulsion (antigravity) with a positive energy-momentum density of bodies and without considering negative mass or exotic forms of matter, and presents other evidence of the reality of antigravity (invariant quantities, local measurability, observer consistency, equations in covariant form, and correspondence with the Dixon equations, and analogies with electromagnetism).

A clear proof of the principles discussed above is the technology used by humanity on a daily basis in GPS/GLONASS satellites, namely the gravitational and kinematic corrections that are incorporated into the algorithms of these systems. The speed of a satellite is something that we can control, and the speed of an object determines the rate of time flow, which means that we can also control this. The gravitational and kinematic corrections that are incorporated into the GPS/GLONASS system (which depend on the speed of the satellite) lead to accurate results for humans, and therefore humans are already using the results of their control over time. Similarly, in the definition of gravity and antigravity, the same principle of the sum of gravitational and kinematic time dilation applies, but the only difference is the scale. To change the direction of the gravitational force vector (i.e., to achieve antigravity), the object must be accelerated to more than 70.7% of the speed of light.

The analogy between an airplane wing and an antigravity wing is also illustrative:

- **Airplane wing:** The geometry of an airplane wing provides for the appearance of a lift force, which is caused by the velocity gradient of the air flow above and below the wing (the difference in air pressure), creating a resultant upward force.

- **Antigravity wing:** The curvilinear motion of a material matter element as part of an antigravity wing provides for the appearance of an antigravity force, which is caused by the velocity gradient between the far and near ends of this element (the difference in the flow of time), creating a resultant upward force.

If the airplane wing is flat, there is no lift force. If the motion of matter is straight, there is no antigravity force. It's very simple: the curved space of time, like air, is a real physical entity. In both cases, we don't just

"spin/accelerate the material matter elements in an antigravity wing" or "spin the blades of a helicopter" or "accelerate an airplane," but we provide the system with additional energy, which, due to the geometry of the airplane wing, results in different air flow velocities at the top and bottom of the wing, and in the case of an antigravity wing, results in different time flow velocities at the top and bottom of the antigravity wing element, and in both cases, this different flow determines the force vector.

In addition to the above, it should be noted that from a technical point of view, rotation seems to be the most convenient way to achieve curvilinear motion. However, this does not mean that an antigravity wing, for example, will be represented by a rotating disk; it will be much more complex. No one is planning to rotate iron blocks at insane speeds in reality, and no one is planning to rotate disks; this will not happen in reality. Several articles on the resource [1] have already been dedicated to the experimental proof and technical implementation of antigravity.

Let's summarize the final results. The derivation within the framework of general relativity allowed us to obtain a formula for the gravitational force acting on a material element moving in the gravitational field of a massive body. We established the existence of a critical speed, exceeding which leads to a change in the sign of the force from attraction to repulsion.

Let us note the key points:

- The antigravity effect is caused by the difference in conditions at the ends of a long object;
- It is possible with a positive mass and without involving exotic forms of matter, and it does not violate fundamental physical principles;
- The effect is invariant and measurable, which confirms its physical reality.

Thus, a new mechanism of gravitational interaction in general relativity has been discovered, expanding our understanding of the dynamics of long objects and opening up prospects for both theoretical and experimental research in the future.

References:

1. Antigravity. Relativistic model of antigravity interaction of bodies. – URL: <https://antigravity-theory.ru> (date of request: 03.03.2026).
2. Ponomarev Dmitry V. Antigravity as a consequence of the principle of extremality of proper time for a long object with a velocity gradient in general relativity. – URL: <https://antigravity-theory.ru/antigravity-gtr> (date of request: 03.03.2026).
3. Ponomarev Dmitry V. The basic equation of antigravity // Internauka: Electronic Scientific Journal. 2025. No. 26(390). Part 3. Pp. 17-23. – URL: <https://internauka.org/journal/science/internauka/390> (date of request: 03.03.2026).
4. Ponomarev Dmitry V. The antigravity point // Internauka: Electronic Scientific Journal. 2025. No. 27(391). Part 2. Pp. 34-44. – URL: <https://internauka.org/journal/science/internauka/391> (date of request: 03.03.2026).
5. Ponomarev Dmitry V. The antigravity force // Internauka: Electronic Scientific Journal. 2025. No. 28(392). Part 2. Pp. 64-68. – URL: <https://internauka.org/journal/science/internauka/392> (date of request: 03.03.2026).

© Ponomarev D., 2026



МАТЕМАТИКА

Orusov Gurbansahet, lecturer

Pedagogical school named after Aman Kekilov

Ashgabat, Turkmenistan

Babayev Annaguly, lecturer

Yoldashov Guvanch, student

International Horse breeding academy named after Aba Annaev

Kakamyradova Ogulbahar, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

THE IMPORTANCE OF MATHEMATICS IN MODERN SCIENCE AND TECHNOLOGY

Abstract

This article explores the fundamental role of mathematics in science, technology, and everyday life. Mathematics is the language of logic, reasoning, and quantitative analysis. It provides tools for problem-solving, modeling natural phenomena, and developing innovative technologies. The paper discusses the applications of mathematics in fields such as physics, engineering, computer science, economics, and data analysis, emphasizing its critical importance for scientific progress and technological development.

Keywords:

mathematics, problem-solving, modeling, technology, science, quantitative analysis, applied mathematics.

Introduction

Mathematics is a universal language that enables humans to understand and describe patterns, structures, and relationships in the world around them. From basic arithmetic to advanced calculus and abstract algebra, mathematics underpins the study of natural sciences, engineering, and information technology.

The importance of mathematics extends beyond academia. It is essential for logical thinking, decision-making, and innovation. The growth of technology and digital systems has increased the reliance on mathematical methods for modeling, simulation, and optimization.

Applications of Mathematics

1. **Physics and Engineering:** Mathematical equations describe physical laws, model systems, and predict behavior in mechanics, thermodynamics, and electromagnetism.

2. **Computer Science:** Algorithms, data structures, and machine learning rely on discrete mathematics, linear algebra, and probability theory.

3. **Economics and Finance:** Statistical analysis, modeling, and optimization help in risk assessment, resource allocation, and economic forecasting.

4. **Data Analysis and Statistics:** Mathematics enables the interpretation of large datasets, evaluation of trends, and prediction of outcomes.

5. **Technological Innovation:** Cryptography, digital communications, robotics, and artificial intelligence are built on mathematical principles.

Importance in Education and Research

Mathematics develops critical thinking, logical reasoning, and problem-solving skills. Students trained in mathematics are better prepared to approach complex problems systematically and analytically. In research, mathematical models are indispensable for designing experiments, analyzing results, and validating theories.

Challenges and Future Directions

Despite its importance, mathematics education faces challenges:

- Making abstract concepts accessible and engaging.
- Encouraging interdisciplinary applications of mathematics.
- Developing computational and modeling skills alongside theoretical knowledge.

Future directions include integrating mathematics with technology, AI, and data science to tackle real-world problems efficiently and innovatively.

Conclusion

Mathematics is the foundation of science, technology, and modern society. Its applications span from theoretical research to practical problem-solving in industry, economics, and information technology. Mastery of mathematics empowers individuals and organizations to innovate, make informed decisions, and understand the world quantitatively. Its continued development is essential for scientific progress and technological advancement.

References:

1. Stewart, J. *Calculus: Early Transcendentals*. Cengage Learning, 2016.
2. Strang, G. *Introduction to Linear Algebra*. Wellesley-Cambridge Press, 2016.
3. Devlin, K. *Mathematics: The Science of Patterns*. W.H. Freeman, 2011.
4. Rogers, H. *Applied Mathematics for Scientists and Engineers*. Springer, 2017.
5. Spiegel, M., & Liu, J. *Mathematical Handbook of Formulas and Tables*. McGraw-Hill, 2015.

©Orusov G., Babayev A., Yoldashov G., Kakamyradova O., 2026



КУЛЬТУРОЛОГИЯ

УДК 7

Сапармурадова Говхер Батыргельдыевна, преподаватель,
Сапармурадова Говхер Батыргельдыевна, студентка,
Государственная академия художеств Туркменистана
г. Ашхабад, Туркменистан

ПОРТРЕТНЫЕ ПРОИЗВЕДЕНИЯ ЙЕДИНАЗАРА МАДАТОВА

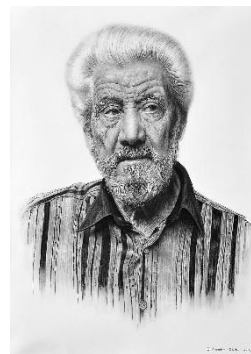
Аннотация

Статья посвящена творчеству заслуженного деятеля культуры Туркменистана, скульптора Йединазара Мадатова. Рассматриваются скульптурные портреты современников, музыкантов и композиторов. Так же выявляются художественные особенности, характер и композиционное решение человеческого образа.

Ключевые слова:

скульптор, объемно-художественные аспекты, проект, символизирует, контраст, энергия, художественный характер, философских размышлениях.

Творчество заслуженного деятеля культуры Туркменистана Йединазара Мадатова чрезвычайно интересно. Его работы отличаются простотой, сильной притягательностью и четкостью своеобразных объемно-художественных аспектов. Он родился 2 февраля 1939 года в Тедженском этрапе Ахалского веляята (рисунок 1). Одухотворенная любовь к Родине жила в сердце скульптора на протяжении всей его жизни, раскрывая богатый характер его творчества. Его детское увлечение искусством привело к тому, что в 1957 году он поступил в Туркменское государственное художественное училище имени Шота Руставели. В период обучения 1962-ом году он выделялся талантом, успешно готовясь к занятиям и вовремя выполняя задания своих наставников. В 1963 году он успешно окончил училище и в том же году поступил в Ташкентский государственный театрально-художественный институт имени А. Т. Шетинина. На своем творческом пути он создал ряд скульптурных портретов, основанных на жизненных и философских размышлениях о реальности. Среди них — образы известных деятелей искусства нашей страны: поэтов, писателей, бахши-музыкантов, коллег-скульпторов и художников. Через различные средства он стремился гармонизировать движения внутренних чувств моделей. Основную часть творчества мастера составляют монументальные и станковые декоративные скульптуры.



За усердный труд в 1991 году ему было присвоено звание заслуженного деятеля искусств Туркменистана. В 2009 году его прекрасные работы способствовали получению премии Союза художников Туркменистана имени Б. Нурали, а в 2010 году он был удостоен звания Народного художника Туркменистана [4].

Произведения, создаваемые туркменскими скульпторами, современны. Работая над различными проектами, они в основном обращаются к образу человека. Развитие жанра портрета связано с путём раскрытия внутреннего мира человека. Скульптура как вид искусства является одной из самых почитаемых частей культурного наследия туркменского народа. Ценность этого искусства возносится на небывалую высоту благодаря творческим работам современных скульпторов. Портрет — это изображение или образ одного человека или группы людей в живописи, скульптуре или графике. Портреты, в свою очередь, делятся на несколько видов [1, 398 с.]. В истории мирового

изобразительного искусства этот жанр занимает очень важное место. С тех времен в прошлом, когда еще не существовало фотоаппаратуры, и до наших дней роль изобразительного искусства в запечатлении природы, животного мира и образов выдающихся личностей остается чрезвычайно высокой. Более того, следы, оставленные изобразительным искусством в истории, имеют огромное значение и как исторический источник для изучения нашего прошлого. В науке об искусствоведении жанр портрета делится на несколько направлений: автопортрет, двойной портрет, групповой, парадный, семейный и детский портреты [2].

Создавая портретные произведения, скульптор не просто следовал натуре, но и придумывал интересный сюжет. К таким работам можно отнести: «Портрет Бабасары Аннамурадова» (1980) (рисунок 2). Здесь изображен Народный художник Туркменистана, мастер-скульптор Бабасары Аннамурадов, который был коллегой и близким другом Мадатова. Будучи коллегами, они на протяжении многих лет вместе создали несколько произведений. Мадатов в этих двух портретах мастерски воплотил подлинный облик известного туркменского скульптора. Скульптор уже во второй раз обращается к образу своего друга Б.Аннамурадова. В этом произведении скульптор полностью раскрывает свое мастерство, изображая его облик в вертикальном виде. Он запечатлен в момент работы, его фигура полностью заполнена рельефными изображениями. В этих рельефных фигурах можно увидеть скульптурные произведения созданные Бабасары Аннамурадовым. Здесь представлены такие работы, как: «Женщина в платке (Абат)», «Всадник (Наездник)», «Старик в шляпе» и другие ранние произведения скульптора, собранные воедино. Мадатов в этом портрете очень профессионально и мастерски передал образ Б. Аннамурадова как ответственного и трудолюбивого человека.



Скульптор также часто обращается к образам личностей, оставивших значительный след в мировой истории. Ведь при создании таких образов он предварительно изучает информацию по старым фотографиям и книгам. К ряду таких работ можно отнести портрет под названием «Альберт Эйнштейн» (1978), (рисунок 3).

Альберт Эйнштейн родился 14 марта 1879 года в Германии. В этом произведении изображен всемирно известный учёный-физик. Ограничившись изображением только головы великого учёного, скульптор смог передать его мощный интеллект. В его тщательно проработанном облике видны мудрые морщины и живая энергия. Влияние реализма в произведение передаётся через сильные чувства, что отражает глубокое уважение Й. Мадатова к великому учёному.

В творчестве скульптора также часто встречаются образы отечественных и зарубежных певцов, музыкантов и композиторов. Среди скульптур, запечатлевших образы музыкантов, особое место занимает работа «Шагающий Бетховен» (рисунок 4), созданная в 1982 году. В этом произведении изображен великий композитор Людвиг Ван Бетховен. Скульптор создал этот образ, вдохновляясь прослушиванием его музыки. Композитор здесь показан простым, скромным, погруженным в свои внутренние мысли. На его лице можно увидеть гордое и величественное выражение.

Изображение того, как он делает шаг вперёд, словно символизирует его стремление к созданию новых музыкальных композиций. В решении этого произведения чувствуется монументальность, мощь и элементы кубизма.

Эта ростовая фигура первого представителя туркменского изобразительного искусства выполнена методом резьбы по тутовому дереву. Её размеры составляют 117x60x35 см. Живописец изображен идущим широким



шагом с тростью в руке. Его облик очень чётко, выразительно и плавно передаёт художественный характер дерева.

Скульптор Йединазар Мадатов ушел из жизни 14 февраля 2017 года в городе Ашхабаде. Его чувство верности правде жизни бессмертно. И сегодня произведения, созданные Й.Мадатовым, находят своё место в экспозициях музеев и завоёвывают любовь туркменского народа. Творчество Йединазара Мадатова пропитана любовью к солнечному Туркменистану и нежностью к созидателям, преобразующим родную землю.

Изучая наследие Й.Мадатова, можно убедиться, что его скульптурные работы включают в себя: портретные произведения, декоративные работы, абстрактные и модернистские композиции.

Список использованной литературы:

1. Мухатова О. Первые шаги национальной школы живописи Туркменистана. – А.: Туркменская государственная издательская служба, 2018.
2. Сапармурадова Г. Автопортреты в туркменской живописи.
3. Утомышева О. Скульптура. – А.: Туркменская государственная издательская служба, 2017.
4. Ирэна Кистович. Статья к приглашению на персональную выставку к 70-летию Еди Мадатова, 2009.

© Сапармурадова Г.Б., Сапармурадова Г.Б., 2026



ТЕХНИКА И ТЕХНОЛОГИЯ

Agasenov Didarmuhammet, lecturer
Gurbanmyradov Ahmet, student
Ekayev Abdulreshit, student
Magtymguly Turkmen State University
Ashgabat, Turkmenistan

COMPUTER GRAPHICS: TECHNOLOGICAL ADVANCEMENTS AND APPLICATIONS IN MODERN SOCIETY

Abstract

This article explores the field of computer graphics, its technological advancements, and its applications across multiple sectors including entertainment, education, healthcare, and engineering. Computer graphics (CG) involves the creation, manipulation, and rendering of visual content using computational techniques. The paper discusses the evolution of computer graphics, its key components such as 2D and 3D modeling, rendering, and animation, and highlights modern trends such as virtual reality (VR), augmented reality (AR), and real-time graphics. Additionally, challenges in hardware, software, and performance optimization are analyzed.

Keywords:

computer graphics, 2D graphics, 3D modeling, rendering, animation, virtual reality, augmented reality, GPU, visualization.

Introduction

Computer graphics (CG) is a subfield of computer science that focuses on generating and manipulating visual content through computational methods. It combines mathematics, physics, and computational algorithms to create images, animations, and interactive environments.

Since its inception in the 1960s, computer graphics has transformed industries such as entertainment, architecture, medicine, education, and virtual simulation. With the development of modern GPUs, advanced algorithms, and real-time rendering techniques, CG has become integral to gaming, film production, scientific visualization, and digital content creation.

Historical Development of Computer Graphics

1. **Early Era (1960s–1970s):** Introduction of vector graphics and basic 2D rendering systems. Early displays such as cathode-ray tubes (CRTs) visualized simple geometric shapes.
2. **Raster Graphics Era (1980s):** Pixels replaced vectors as the primary method of image representation, allowing detailed 2D images and early 3D wireframe models.
3. **3D Graphics (1990s–2000s):** The emergence of 3D modeling software, texture mapping, and shading algorithms revolutionized visual realism. GPUs specialized for graphics processing accelerated rendering performance.
4. **Modern Era (2010s–present):** Real-time ray tracing, VR/AR, AI-assisted graphics, and interactive visualization dominate the field. Cloud-based rendering and procedural generation enable scalable and immersive experiences.

Components of Computer Graphics

1. 2D Graphics

- Involves creating images in two dimensions.
- Applications include graphic design, web graphics, UI/UX design, and 2D animations.
- Techniques: vector graphics, rasterization, image processing, and compositing.

2. 3D Graphics

- Involves creating three-dimensional models and environments.

- Key stages:

1. **Modeling:** Creating geometry for objects using polygons, NURBS, or procedural methods.
2. **Texturing and Shading:** Applying surface properties, colors, and patterns.
3. **Lighting:** Simulating light sources and shadows to enhance realism.
4. **Rendering:** Converting 3D scenes into 2D images using algorithms like rasterization or ray tracing.
5. **Animation:** Simulating motion and interaction over time.

3. Real-Time Graphics

- Essential for gaming, VR/AR, and simulations.
- Techniques focus on performance optimization, reducing latency, and realistic visuals.
- Modern GPUs, shaders, and physics engines play critical roles.

Applications of Computer Graphics

1. **Entertainment:** Movies, animation, and video games rely heavily on CG for storytelling, visual effects, and interactive experiences.
2. **Education and Training:** Virtual labs, simulations, and interactive learning platforms provide hands-on experience.
3. **Healthcare:** Medical imaging, surgical simulation, and anatomy visualization enhance diagnostics and training.
4. **Engineering and Architecture:** CAD, virtual prototyping, and 3D modeling assist design and construction processes.
5. **Scientific Visualization:** Complex data in physics, chemistry, and meteorology is represented visually for analysis and decision-making.

Modern Trends

- **Virtual Reality (VR) and Augmented Reality (AR):** Immersive experiences for gaming, training, and industrial simulations.
- **Real-Time Ray Tracing:** Achieves photorealistic visuals in interactive applications.
- **AI in Graphics:** AI enhances rendering, texture creation, and procedural animation.
- **Cloud-Based Rendering:** Remote computation enables high-quality rendering for users with limited hardware.

Challenges

- **Hardware Limitations:** High-quality rendering requires powerful GPUs and memory.
- **Algorithm Complexity:** Realistic physics, lighting, and particle effects demand sophisticated algorithms.
- **Realism vs. Performance:** Balancing visual fidelity with computational efficiency is critical.
- **Data Management:** Complex scenes and large assets require effective storage and memory optimization.

Conclusion

Computer graphics has become a foundational element of modern technology, impacting entertainment, education, healthcare, engineering, and scientific research. Advancements in GPU architecture, real-time rendering, AI, and immersive technologies continue to expand the potential of CG. The field combines creativity, mathematics, and computer science, enabling both practical applications and artistic expression. As computational power and algorithms improve, the boundaries of realism, interactivity, and virtual experiences will continue to expand.

References:

1. Foley, J., van Dam, A., Feiner, S., & Hughes, J. Computer Graphics: Principles and Practice. Addison-Wesley, 2013.

- Hearn, D., & Baker, M. P. Computer Graphics with OpenGL. Pearson, 2014.
- Watt, A., & Policarpo, F. 3D Computer Graphics. Addison-Wesley, 2018.
- Akenine-Möller, T., Haines, E., & Hoffman, N. Real-Time Rendering. CRC Press, 2018.
- Shreiner, D., Sellers, G., Kessenich, J., & Licea-Kane, B. OpenGL Programming Guide. Addison-Wesley, 2016.

©Agasenov D., Gurbanmyradov A., Ekayev A., 2026

Babayev Annaguly, lecturer

Amanov Muhammet, student

International Horse breeding academy named after Aba Annaev

Durdyyeva Oguloraz, lecturer.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

ARTIFICIAL INTELLIGENCE: TRANSFORMING MODERN INFORMATICS AND SOCIETY

Abstract

This article examines the development and applications of artificial intelligence (AI) within the field of informatics and its impact on modern society. AI technologies, including machine learning, natural language processing, and computer vision, are increasingly applied in healthcare, education, business, and governance. The paper discusses the benefits, challenges, and ethical considerations associated with AI adoption. Emphasis is placed on how AI contributes to automation, data analysis, and decision-making, while shaping social, economic, and technological landscapes.

Keywords:

artificial intelligence, machine learning, informatics, automation, data analysis, ethical AI, digital society.

Introduction

Artificial intelligence (AI) refers to the simulation of human intelligence in machines programmed to think, learn, and adapt. In modern informatics, AI has become a transformative technology, enabling advanced data analysis, predictive modeling, and automated decision-making.

AI systems are now integral to numerous sectors. Healthcare uses AI to diagnose diseases and recommend treatments. Businesses leverage AI for customer analytics and supply chain optimization. Education employs AI for personalized learning, while governments utilize AI for smart city management and public services.

Applications of AI in Informatics

1. **Machine Learning:** Algorithms learn from data patterns, enabling predictive analytics and intelligent decision-making in industries such as finance, healthcare, and logistics.

2. **Natural Language Processing (NLP):** AI can understand and process human language, powering chatbots, virtual assistants, and translation tools.

3. **Computer Vision:** AI recognizes images and video content, assisting in security, medical imaging, and autonomous vehicles.

4. **Automation:** Repetitive and labor-intensive tasks can be automated, increasing efficiency and

reducing human error.

5. **Data Analytics:** AI systems analyze massive datasets to uncover insights and trends, supporting strategic planning and research.

Benefits and Challenges

The benefits of AI include increased efficiency, enhanced problem-solving, improved accuracy, and new opportunities for innovation. AI also facilitates the processing of big data, allowing organizations to make informed decisions faster than ever before.

Challenges include:

- Ethical considerations such as bias, transparency, and accountability.
- Job displacement due to automation.
- Security concerns related to AI-driven systems.
- Need for regulation and governance to ensure responsible AI use.

Ethical and Social Considerations

AI adoption requires careful attention to ethical principles. Transparency in decision-making, fairness, and privacy protection are critical for public trust. Society must balance technological advancement with social responsibility, ensuring that AI benefits all communities while minimizing negative consequences.

Conclusion. Artificial intelligence is a cornerstone of modern informatics, revolutionizing how data is processed, decisions are made, and services are delivered. Its applications in healthcare, education, business, and governance demonstrate its potential to enhance productivity, innovation, and social development. Careful consideration of ethical and social impacts is essential to ensure that AI continues to serve as a positive force in modern society.

References:

1. Russell, S., & Norvig, P. Artificial Intelligence: A Modern Approach. Pearson, 2021.
2. Goodfellow, I., Bengio, Y., & Courville, A. Deep Learning. MIT Press, 2016.
3. Tegmark, M. Life 3.0: Being Human in the Age of Artificial Intelligence. Knopf, 2017.
4. Domingos, P. The Master Algorithm: How the Quest for the Ultimate Learning Machine Will Remake Our World. Basic Books, 2015.
5. UNESCO. Recommendation on the Ethics of Artificial Intelligence. Paris, 2021.

©Babayev A., Amanov M., Durdyyeva O., 2026

Babayev Annaguly, lecturer

Amanov Muhammet, student

International Horse breeding academy named after Aba Annaev

Durdyyeva Oguloraz, lecturer.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

BIG DATA: DRIVING INNOVATION AND DECISION-MAKING IN MODERN INFORMATICS

Abstract

This article explores the concept of Big Data and its transformative impact on modern information

technology and society. Big Data refers to extremely large datasets that can be analyzed computationally to reveal patterns, trends, and associations. The paper discusses the characteristics of Big Data, its applications across various sectors, challenges in storage and processing, and its role in improving decision-making, innovation, and efficiency.

Keywords:

big data, data analytics, information technology, machine learning, decision-making, data-driven innovation, digital society.

Introduction

In the era of digital transformation, data has become a critical asset. Organizations generate and collect massive amounts of data from various sources, including social media, sensors, financial transactions, healthcare records, and scientific experiments. Big Data refers to datasets so large and complex that traditional data-processing techniques are insufficient.

The analysis of Big Data enables organizations to uncover valuable insights, optimize processes, and predict future trends. It is increasingly applied in sectors such as healthcare, finance, agriculture, education, and governance.

Characteristics of Big Data

Big Data is often described by the following five characteristics, known as the **5Vs**:

1. **Volume:** Massive quantities of data generated every second from multiple sources.
2. **Velocity:** High speed at which data is generated, processed, and analyzed.
3. **Variety:** Data comes in diverse formats, including text, images, videos, and sensor outputs.
4. **Veracity:** Ensuring data accuracy, reliability, and trustworthiness.
5. **Value:** Extracting meaningful insights and actionable intelligence from raw data.

Applications of Big Data in Informatics

1. **Healthcare:** Predictive analytics improve diagnosis, treatment plans, and personalized medicine.
2. **Business and Finance:** Big Data enables market analysis, customer behavior prediction, and fraud detection.
3. **Agriculture:** Data from sensors and satellites helps optimize irrigation, crop management, and yield prediction.
4. **Education:** Learning analytics personalize student learning experiences and enhance educational outcomes.
5. **Smart Cities:** Big Data supports traffic management, energy optimization, and urban planning.

Challenges

Despite its potential, Big Data presents several challenges:

- **Storage and Management:** Storing massive datasets efficiently requires advanced cloud and distributed computing technologies.
- **Data Privacy and Security:** Protecting sensitive information is critical to prevent breaches and misuse.
- **Data Quality:** Ensuring accuracy, consistency, and completeness is essential for meaningful analysis.
- **Skilled Workforce:** Analyzing Big Data requires trained professionals with expertise in analytics, programming, and machine learning.

Conclusion

Big Data is a transformative force in modern informatics, enabling data-driven decision-making, innovation, and efficiency. Its applications span healthcare, business, agriculture, education, and urban development. Addressing challenges related to storage, security, and skills is critical to fully harness the

potential of Big Data. As technology advances, Big Data will continue to reshape how organizations and societies operate, driving progress in the digital age.

References:

1. Mayer-Schönberger, V., & Cukier, K. Big Data: A Revolution That Will Transform How We Live, Work, and Think. Houghton Mifflin Harcourt, 2013.
2. Chen, M., Mao, S., & Liu, Y. Big Data: A Survey. Mobile Networks and Applications, 2014.
3. Marr, B. Big Data in Practice. Wiley, 2016.
4. Provost, F., & Fawcett, T. Data Science for Business. O'Reilly, 2013.
5. Kitchin, R. The Data Revolution: Big Data, Open Data, Data Infrastructures & Their Consequences. Sage, 2014.

©Babayev A., Amanov M., Durdyyeva O., 2026

Gulamova Gozel, lecturer

Pedagogical school named after Aman Kekilov

Ashgabat, Turkmenistan

Hanov Tejen, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

CYBERSECURITY AND DATA PROTECTION IN THE AGE OF INFORMATION TECHNOLOGY

Abstract

In the modern digital era, cybersecurity and data protection have become critical components of information technology. This article explores the importance of securing digital information, protecting user privacy, and maintaining the integrity of IT systems. Key issues such as cyber threats, encryption methods, risk management, and ethical considerations are discussed. The study highlights the growing need for trained professionals in cybersecurity and emphasizes the societal and organizational impacts of secure information systems.

Keywords:

cybersecurity, data protection, information technology, encryption, digital security, cyber threats, privacy.

Introduction

With the rapid expansion of information technology, digital data has become one of the most valuable assets for individuals, organizations, and governments. From personal information to financial transactions and national security data, protecting digital assets is essential. Cybersecurity is the practice of safeguarding information systems from theft, damage, or unauthorized access.

The rise of the internet, cloud computing, and mobile technologies has increased exposure to cyber risks. Modern threats include malware, ransomware, phishing attacks, and data breaches. As technology advances, so do the methods and sophistication of cyber-attacks.

Importance of Cybersecurity

Cybersecurity is crucial for multiple reasons:

1. **Protecting Privacy:** Personal data, including identity and financial information, must be secured to prevent misuse.
2. **Safeguarding Business Operations:** Enterprises rely on secure networks to ensure continuity, protect intellectual property, and maintain customer trust.
3. **National Security:** Governments must protect sensitive information from cyber-espionage and attacks on critical infrastructure.
4. **Digital Trust:** Cybersecurity enables safe online communication, e-commerce, and e-governance, strengthening public confidence in IT systems.

Methods and Technologies

Modern cybersecurity employs a combination of technical and organizational measures:

- **Encryption:** Securing data using cryptographic algorithms to prevent unauthorized access.
- **Firewalls and Intrusion Detection Systems:** Monitoring network traffic to identify and block potential threats.
- **Two-Factor Authentication (2FA):** Strengthening access control by requiring additional verification steps.
- **Security Policies and Awareness:** Educating users and organizations about safe practices and risk management.

The field also integrates artificial intelligence and machine learning to detect unusual patterns and respond to threats in real-time.

Challenges and Future Directions

Despite advancements, cybersecurity faces ongoing challenges:

- Increasingly sophisticated cyber-attacks.
- Shortage of trained cybersecurity professionals.
- Balancing security with usability and performance.
- Ethical and legal considerations regarding data privacy and surveillance.

Future developments in quantum computing, AI-based threat detection, and blockchain technology are expected to transform cybersecurity strategies, making them more adaptive and resilient.

Conclusion

In the age of information technology, cybersecurity and data protection are essential for safeguarding personal, organizational, and national digital assets. Continuous technological innovation, professional training, and ethical awareness are critical to maintaining secure and reliable information systems. As the digital world evolves, cybersecurity will remain a cornerstone of safe and trustworthy technological progress.

References:

1. Stallings, W. Network Security Essentials: Applications and Standards. Pearson, 2020.
2. Schneier, B. Data and Goliath: The Hidden Battles to Collect Your Data and Control Your World. W.W. Norton, 2015.
3. Pfleeger, C. & Pfleeger, S. Security in Computing. Prentice Hall, 2019.
4. Anderson, R. Security Engineering: A Guide to Building Dependable Distributed Systems. Wiley, 2020.
5. Cisco Systems. Cybersecurity Fundamentals. Cisco Press, 2021.

Gurbanmyradova Uzukjema, Lecturer

Annaberdiyeva Merjen, Student

International Horse breeding academy named after Aba Annayev

Yalkabova Humay, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

THE POSSIBILITIES OF THE DIGITAL ECONOMY

Abstract

The digital economy represents a fundamental, technology-driven transformation of economic activity, production, and commerce. It encompasses the network of economic and social activities enabled by information and communication technologies (ICT), particularly the Internet, mobile devices, and digital platforms. This paradigm shift moves beyond mere digitization of existing processes to create entirely new markets, business models, and forms of value. Key characteristics include the dominance of data as a primary resource, the prevalence of platform-based business models, and the blurring lines between physical and digital goods and services. The digital economy offers unprecedented opportunities for inclusive growth, enhanced productivity, and global market access, but it simultaneously presents challenges related to cybersecurity, digital skills gaps, and regulatory adaptation. This article explores the core components of the digital economy, its transformative potential across major sectors, and the necessary policy frameworks to harness its capabilities for sustainable development.

Keywords:

digital transformation, data economy, e-commerce, cloud computing, FinTech, platform economy, artificial intelligence (AI), Internet of Things (IoT), blockchain, cybersecurity.

Applications of Advanced Technology

The possibilities of the digital economy are most clearly demonstrated through the application of advanced technologies that fundamentally reshape traditional sectors:

1. E-commerce and Retail

- Transformation: E-commerce platforms (like Amazon or Alibaba) have democratized retail, allowing small businesses to access global markets and offering consumers unparalleled choice and convenience. The integration of AI allows for hyper-personalized marketing and inventory management.

- Example: A small artisanal craft business in a remote location can use a global e-commerce platform to sell its products to customers worldwide, a feat impossible in a purely physical economy. Data analytics on purchase patterns guide production and pricing decisions, maximizing profitability.

2. Finance (FinTech)

- Transformation: Digital finance utilizes technology to improve and automate the delivery and use of financial services. Technologies like blockchain enable secure, transparent, and decentralized transactions, while mobile payments expand financial inclusion.

- Example: Mobile banking apps allow millions in developing nations to manage finances, make payments, and access credit without needing a physical bank branch, thus lowering the cost of financial services and integrating the unbanked into the formal economy. Peer-to-peer lending platforms use algorithms to assess credit risk more efficiently than traditional banks.

Conclusion

The digital economy is not a sector in itself but the underlying infrastructure for all modern economic

activity. Its potential to accelerate global growth, increase efficiency, and foster innovation is immense, driven primarily by the strategic use of data and platform technologies. Leveraging this potential requires governments and businesses to invest heavily in digital infrastructure, cultivate digital literacy and skills in the workforce, and establish agile regulatory frameworks to ensure fair competition, data privacy, and cybersecurity. As technology continues to advance, the distinction between the "digital" and "traditional" economy will dissolve, solidifying the digital framework as the core engine of future prosperity and societal advancement.

References:

1. Tapscott, D. (1996). *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*. McGraw-Hill.
2. Schwab, K. (2016). *The Fourth Industrial Revolution*. Crown Business.
3. Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., & Marrs, A. (2013). *Disruptive technologies: Advances that will transform life, business, and the global economy*. McKinsey Global Institute.
4. World Economic Forum. (2024). *The Future of Jobs Report*. (Relevant annual edition).
5. UNCTAD (United Nations Conference on Trade and Development). (2023). *Digital Economy Report*. (Relevant annual edition).

©Gurbanmyradova U., Annaberdiyeva M., Yalkabova H., 2026

Gurbanmyradova Uzukjema,

Lecturer

Tillayeva Arzygul,

Student

International Horse breeding academy named after Aba Annayev

Pollabayeva Ogulay,

Student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

THE FOUNDATION OF THE DIGITAL AGE

Abstract

The modern digital system is built upon a constantly expanding and accelerating **global infrastructure**. This growth is characterized by three main components: vast networks of fiber-optic cables, the proliferation of data centers, and the rapid evolution of wireless technologies (e.g., 5G/6G). The continuous investment in these foundational elements has exponentially increased the speed, capacity, and reach of data transmission, enabling everything from cloud computing to the Internet of Things (IoT). The relentless demand for instant access to information and processing power dictates the pace of this infrastructural expansion, transforming once physical constraints (like distance) into solvable engineering challenges. This article explores the physical and virtual components driving the growth of the digital system's backbone.

Keywords:

Digital Infrastructure, Fiber Optics, Data Centers, Cloud Computing, 5G, Bandwidth, Network Latency, Internet Backbone.

Physical Pillars of Digital Growth

The expansion of the digital system relies on tangible, high-capacity components.

The Infrastructure Mandate: To transmit and store an exponentially increasing volume of data with high speed and reliability.

Key Areas of Infrastructural Growth:

- **Subsea Cables:** Connecting continents and enabling global trade and communication.
- **Edge Computing:** Distributing computational power closer to the end-user to reduce latency.
- **Hyperscale Data Centers:** Massive, energy-intensive facilities that house the world's data and run cloud services.

Core Components and Illustrative Examples in Practice

1. The Revolution of Fiber-Optic Networks

Fiber optics are the circulatory system of the internet, transmitting data as light pulses.

Example: The Growth of Subsea Cables

- **Past (2000s):** Cables primarily connected major economic hubs (New York to London). Capacity was measured in terabits per second (Tbps), but overall reach was limited.
- **Present (2020s):** New projects, like the *2Africa* cable, encircle entire continents and connect secondary markets. Capacity now reaches hundreds of Tbps per cable system.
- **Practical Impact:** This expansion drastically lowers **latency** and cost in developing regions, enabling millions of people to access high-speed services like video streaming and sophisticated financial trading platforms simultaneously.

2. The Rise of Hyperscale Cloud Data Centers

These massive facilities, operated by tech giants (Amazon, Google, Microsoft), are the storage and processing engine of the digital world.

- **Procedure:** A major corporation migrates its entire IT operation (servers, applications, databases) from its local office to a **Cloud Service Provider (CSP)** data center.
- **Illustrative Effect:** The corporation no longer needs to buy and maintain its own servers. The CSP manages the scaling, security, and maintenance, allowing the company to handle massive, instant spikes in user traffic (e.g., during a major online sale).
- **Practical Impact:** This switch from **on-premise** to **cloud infrastructure** is the core driver behind the demand for new hyperscale data centers, which are often built near renewable energy sources to manage their vast power consumption.

Conclusion

The continuous, aggressive growth of digital infrastructure—driven by fiber optics, data centers, and ever-faster wireless standards—is what makes the digital system a true global utility. This investment ensures that the digital future will be characterized by not just more data, but data that moves faster and with greater reliability than ever before.

References:

1. TeleGeography. (Current Year). Submarine Cable Map and Submarine Cable Update Reports.
2. Cisco. (Current Year). Cisco Annual Internet Report (2018–2023).
3. Gartner. (Current Year). Hype Cycle for Cloud Computing.
4. Amazon Web Services (AWS) / Microsoft Azure / Google Cloud Platform. (Current Year). White Papers and Architectural Documents on Data Center Design and Sustainability.
5. International Telecommunication Union (ITU). (Current Year). ICT Development Index (IDI) and Telecommunication/ICT Statistics.
6. Schwartz, M. S. (2020). *Networking the World: The Role of Fiber Optics in Global Connectivity*. Springer.

©Gurbanmyradova U., Tillayeva A., Pollabayeva O., 2026

Halbayeva Jeren, lecturer

Yagshygeldi Kakayev International Oil and Gas University

Yagmyrov Myrat, lecturer

Pedagogical school named after Aman Kekilov

Ashgabat, Turkmenistan

Gurbanmyradova Ogulshaker, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

THE ROLE OF INFORMATICS IN MODERN SOCIETY AND TECHNOLOGICAL DEVELOPMENT

Abstract

This article examines the role of informatics and information technologies (IT) in contemporary society. Informatics provides the tools and methods for collecting, processing, and analyzing data, enabling informed decision-making across various sectors including science, education, industry, and government. The paper highlights current trends in IT development such as artificial intelligence, big data, cybersecurity, and digital transformation. The study also emphasizes the significance of computer literacy and technical education in preparing skilled professionals capable of leveraging modern technologies.

Keywords:

Informatics, information technology, artificial intelligence, big data, digital society, computer science, education.

Introduction

Informatics, the science of information processing, has become central to modern life. It underpins advances in scientific research, economic development, communication, and everyday decision-making. With the exponential growth of data and computing capabilities, informatics provides frameworks to analyze complex systems, model phenomena, and optimize processes.

Information technologies are now embedded in nearly every sector. They enable automation, improve efficiency, enhance security, and create new opportunities for innovation. In education, IT facilitates distance learning and access to global knowledge. In science and industry, computational modeling and data analysis drive progress.

Importance and Applications

The applications of informatics in modern society include:

1. **Artificial Intelligence (AI) and Machine Learning:** AI algorithms analyze vast datasets, recognize patterns, and support predictive decision-making in medicine, finance, and engineering.
2. **Big Data Analysis:** Handling large volumes of structured and unstructured data allows organizations to optimize operations, improve products, and forecast trends.
3. **Cybersecurity:** Protecting sensitive information is crucial in banking, healthcare, and government systems. Informatics provides encryption, secure protocols, and threat detection tools.
4. **Digital Transformation:** IT enables businesses and governments to digitize processes, improve efficiency, and create user-centered digital services.
5. **Education and Research:** Computer science and informatics are foundational for modern education, providing simulations, research software, and access to global scientific resources.

Methodology

The study is based on a review of scientific publications, academic textbooks, and research articles in

the field of informatics and information technology. Methods include:

- **Comparative analysis** of different IT tools and applications.
- **Review of case studies** demonstrating the impact of informatics on society and industry.
- **Evaluation of educational strategies** for improving digital literacy and professional IT training.

Discussion

Informatics is not only a technical field but also a societal catalyst. Digital literacy has become essential for participating in modern economic, social, and cultural life. Continuous development in IT requires lifelong learning, interdisciplinary collaboration, and ethical considerations such as data privacy and responsible AI use.

The evolution of informatics also fosters innovation in areas like smart cities, telemedicine, e-governance, and environmental monitoring. By providing tools for analysis, simulation, and automation, informatics accelerates scientific discovery and economic growth.

Conclusion

Informatics is a cornerstone of modern technological development. Its applications span science, industry, education, and society. The integration of advanced IT tools enhances productivity, supports innovation, and strengthens digital literacy. Future development in informatics will continue to shape how individuals, organizations, and governments interact with information and technology, driving progress in all aspects of life.

References:

1. Tanenbaum, A. Computer Networks. Moscow: Piter, 2019.
2. Cormen, T. Algorithms: Design and Analysis. Moscow: Williams, 2020.
3. Stevens, R. Fundamentals of Computer Science and Programming. Moscow: Binom, 2018.

©Halbayeva J., Yagmyrov M., Gurbanmyradova O., 2026



СЕЛЬСКОЕ ХОЗЯЙСТВО

Bashimov Aman,

Director of the "At-Myrat" Education Center.

Kakabayev Toyly,

Student

International Horse breeding academy named after Aba Annaev

Arkadag, Turkmenistan

Dolayeva Suray,

Student of the Department of Language Studies, trained in extended groups

International University of Industrialists and Entrepreneurs

Ashgabat, Turkmenistan

AKHAL-TEKE HORSES: CULTURAL ICONS OF TURKMENISTAN

Abstract

Turkmen horses, notably the Akhal-Teke breed, are a cherished emblem of Turkmenistan's cultural heritage and equestrian excellence. Renowned for their exceptional speed, endurance, and striking beauty, these horses have been integral to the Turkmen people's history and lifestyle for centuries. This article explores the importance of Turkmen horses in shaping cultural identity, their historical significance, and current challenges in preservation and promotion, highlighting their contribution to Turkmen society and their status as national treasures.

Keywords:

Turkmen horses, Akhal-Teke, cultural heritage, equestrian excellence, preservation.

Introduction: Horses have played a central role in the lives of the Turkmen people for millennia, with Turkmen horses celebrated as icons of strength, beauty, and grace. The Akhal-Teke breed, often referred to as the "golden horse", is notable for its physical attributes and deep ties to Turkmen culture, embodying the resilience and spirit of the Turkmen people and their nomadic heritage. This article examines the connection between Turkmen horses and their cultural significance, as well as preservation efforts.

Historical Significance: The origin of Turkmen horses dates back thousands of years to the steppes of Central Asia, where they were selectively bred by nomadic tribes. The Akhal-Teke breed, considered one of the oldest and purest, has a history intertwined with the Silk Road, serving as prized possessions and strategic assets for trade and warfare. Revered throughout history for their agility and stamina, Turkmen horses enabled nomads to traverse vast distances, herding livestock and facilitating trade, representing a vital aspect of Turkmen identity and pride.

The Akhal-Teke Breed's Cultural Importance: The Akhal-Teke breed is renowned for its sleek, muscular build, metallic sheen, and endurance, making them treasured worldwide for their grace and beauty in competitive and recreational equestrianism. As symbols of nobility and prestige, Akhal-Tekes are often featured in Turkmen folklore and art, with traditional horse races and festivals celebrating the bond between horses and owners. These horses reflect their owner's status, with possession of a fine Akhal-Teke signifying commitment to the breed's preservation.

Economic Role and Preservation: Turkmen horses play a crucial economic role as working animals and sources of income for breeders. The cultivation of Akhal-Teke horses supports traditional agricultural practices and modern equestrian sports. International demand has created opportunities for export and tourism, with events showcasing these horses attracting global attention and promoting cultural exchange. The establishment of breeding farms and equestrian facilities has encouraged research and development in equine care and management, focusing on improved breeding techniques and responsible ownership.

Conclusion: Turkmen horses, particularly the Akhal-Teke breed, are symbols of cultural pride, resilience, and national identity. Their historical significance, beauty, and enduring presence highlight their cultural and economic importance. Continued preservation efforts are essential to recognize their invaluable contribution to Turkmenistan's heritage, fostering a deeper understanding of their legacy to support initiatives for future generations. The bond between the Turkmen people and their horses is a testament to the enduring power of tradition and the importance of cultural heritage.

Turkmen horses, particularly the Akhal-Teke breed, are more than mere livestock; they are symbols of cultural pride, resilience, and national identity. Their historical significance, striking beauty, and enduring presence in Turkmen society highlight their importance in both cultural and economic contexts. As efforts to preserve and promote this cherished breed continue, it is essential to recognize the invaluable contribution of Turkmen horses to the richness of Turkmenistan's heritage.

By fostering a deeper understanding of the legacy of Turkmen horses, we can support initiatives aimed at preserving these magnificent animals for future generations. The bond between the Turkmen people and their horses is a testament to the enduring power of tradition, serving as a reminder of the importance of cultural heritage in a rapidly changing world.

References:

1. Abdyrov, M. (2020). "The Historical Journey of Akhal-Teke Horses in Turkmen Culture." *Journal of Central Asian Studies*, 17(2), 91-104.
2. Kuliyyev, A. (2019). "Turkmen Horses: A Cultural and Economic Legacy." *Economic Review of Turkmenistan*, 12(4), 47-63.
3. Huseynov, R. (2018). "Akhal-Teke Horses: A Symbol of Turkmen Identity." *Cultural Identity Studies*, 15(3), 112-126.
4. Annadurdyeva, G. (2021). "Preservation of the Akhal-Teke Breed: Challenges and Strategies." *Journal of Animal Sciences*, 30(1), 55-69.
5. Rakhmanov, T. (2020). "Merging Tradition with Modernity: The Future of Akhal-Tekes." *Journal of Equestrian Studies*, 8(2), 33-47.

© Bashimov A., Kakabayev T., Dolayeva S., 2026

Charyberdiyev Kakageldi,

Lecturer

Berdinazarov Myrat,

Student

International Horse breeding academy named after Aba Annayev

Gylychmyradova Ogulurban,

Student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

ADVANCEMENTS IN VETERINARY MEDICINE: DIAGNOSTICS, TREATMENT, AND ANIMAL WELFARE

Abstract

Veterinary medicine is a critical scientific field that ensures animal health, promotes public safety, and

supports agricultural productivity. This article reviews the latest advancements in diagnostics, treatment methods, disease prevention, and animal welfare. Emphasis is placed on molecular diagnostics, imaging technologies, and preventive veterinary practices. The paper also explores the role of veterinarians in livestock management, companion animal care, and wildlife conservation.

Keywords:

Veterinary medicine, diagnostics, treatment, animal welfare, livestock, molecular diagnostics, imaging technologies, disease prevention.

Introduction

Veterinary medicine plays a vital role in maintaining the health of domesticated, farm, and wild animals. Healthy animals are crucial for food security, economic stability, and public health. The field has evolved significantly, integrating molecular biology, imaging, and digital technologies to enhance diagnostics, treatment, and disease prevention.

The scope of veterinary practice includes companion animals, livestock, equine health, and wildlife. Modern veterinarians must possess knowledge in genetics, microbiology, pharmacology, and epidemiology to effectively manage animal health challenges.

Diagnostics in Veterinary Medicine

1. Molecular Diagnostics:

- PCR, ELISA, and DNA sequencing detect pathogens quickly and accurately.
- Genetic testing identifies hereditary diseases and guides selective breeding.

2. Imaging Technologies:

- X-ray, ultrasound, CT, and MRI aid in diagnosing internal injuries and diseases.
- Advanced imaging allows for early detection and precise treatment planning.

3. Laboratory Analysis:

- Hematology, biochemistry, and microbiology tests monitor animal health.
- Blood, urine, and tissue analyses provide information about systemic conditions.

Treatment and Preventive Strategies

• **Medical Treatments:** Antibiotics, antivirals, anti-parasitic drugs, and supportive therapy address acute and chronic illnesses.

• **Surgical Interventions:** Advanced surgical techniques improve recovery and minimize complications.

• **Vaccination Programs:** Prevent outbreaks of infectious diseases in livestock and pets.

• **Nutrition and Management:** Proper feeding, housing, and hygiene enhance immunity and overall health.

Animal Welfare and Ethics

- Ensuring ethical treatment of animals is fundamental to veterinary practice.
- Welfare assessment includes monitoring behavior, health, and living conditions.
- Policies and guidelines regulate humane treatment, disease prevention, and responsible breeding.

Role of Veterinarians in Agriculture and Livestock

- Disease control in livestock reduces economic losses and improves productivity.
- Monitoring herd health prevents zoonotic disease transmission to humans.
- Implementing biosecurity measures safeguards farms from outbreaks.
- Breeding programs utilize veterinary expertise to enhance genetic quality and animal performance.

Conclusion

Veterinary medicine is a dynamic field that integrates science, technology, and ethics to ensure animal health and welfare. Advancements in molecular diagnostics, imaging, telemedicine, and preventive care have

transformed veterinary practices. By combining traditional expertise with modern technology, veterinarians play a crucial role in safeguarding animal health, supporting agriculture, and promoting public safety. The continuous development of veterinary medicine is essential for addressing global challenges in animal and human health.

References:

1. Smith, B. P. Large Animal Internal Medicine. Elsevier, 2015.
2. Radostits, O. M., Gay, C. C., Hinchcliff, K. W., & Constable, P. D. Veterinary Medicine: A Textbook of the Diseases of Cattle, Sheep, Pigs, Goats, and Horses. Elsevier, 2020.
3. McCurnin, D. M., & Bassert, J. M. Clinical Textbook for Veterinary Technicians. Elsevier, 2019.
4. Gaskell, R., & Tasker, S. Veterinary Medicine and Animal Welfare. Wiley-Blackwell, 2018.
5. Day, M. J., & Horzinek, M. C. Veterinary Vaccinology. Springer, 2021.

©Charyberdiyev K., Berdinazarov M., Gylychmyradova O., 2026

Gurbanmyradova Urukjema,

Lecturer

Tillayeva Arzygul,

Student

International Horse breeding academy named after Aba Annayev

Samykova Gulnar,

Student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city
Arkadag, Turkmenistan

**AKHALTEKE HORSES AND HORSE BREEDING: MORPHOLOGICAL, GENETIC,
AND TECHNOLOGICAL PERSPECTIVES**

Abstract

The Akhalteke horse is one of the world's most distinguished horse breeds, known for its elegance, endurance, and speed. This article examines the morphology, genetics, and breeding practices of Akhalteke horses. The study highlights the role of modern technologies, including molecular genetics, digital monitoring, and data analysis, in improving horse breeding programs. Morphological features, performance capabilities, and selection criteria are discussed. The paper also emphasizes the cultural and economic significance of Akhalteke horses in Turkmenistan and internationally.

Keywords:

Akhalteke horses, horse breeding, morphology, genetics, performance, selection,
digital technology, equine science.

Introduction

Akhalteke horses are a national symbol of Turkmenistan and a vital component of the country's equestrian culture. Recognized for their unique physique, agility, and stamina, they have been bred for centuries using selective breeding techniques.

Modern horse breeding integrates traditional knowledge with contemporary scientific approaches.

Morphological assessment, genetic evaluation, and technological monitoring are essential for maintaining the breed's quality and performance. Akhalteke horses are utilized in sports, cultural events, and breeding programs, demonstrating their versatility and significance.

Morphology of Akhalteke Horses

1. Body Structure:

- Slim, elongated body with a well-defined chest and deep girth
- Long, slender neck and refined head with expressive eyes
- Strong, lean legs enabling agility and endurance
- High-set tail and smooth coat often exhibiting metallic sheen

2. Performance Features:

- Excellent speed and stamina for long-distance racing
- Graceful movements, balance, and flexibility
- Adaptability to harsh climatic conditions

3. Genetic Traits:

- Inherited performance capabilities and temperament
- Selection ensures the preservation of superior morphological traits
- Molecular genetics aids in evaluating lineage and avoiding inbreeding

Horse Breeding Practices

• **Selection:** Horses are selected based on morphology, genetic quality, temperament, and performance.

- **Genetic Analysis:** Molecular markers and DNA analysis improve selection accuracy.
- **Performance Testing:** Speed, endurance, and agility are evaluated through standardized tests.
- **Training and Care:** Nutrition, exercise, and veterinary care are integral to optimal development.

Applications and Importance

1. **Sports and Racing:** Akhalteke horses are used in long-distance races and equestrian competitions.
2. **Cultural Heritage:** Representing Turkmen national identity, they feature prominently in festivals and ceremonies.
3. **Breeding Programs:** Maintain the genetic diversity and quality of the breed.
4. **Technological Integration:** GPS monitoring, biomechanical analysis, and data collection optimize training and breeding decisions.

Modern Technologies in Horse Breeding

- **Molecular Genetics:** Identifies desirable traits and prevents inbreeding.
- **Digital Monitoring:** Sensors and wearables track heart rate, gait, and performance metrics.
- **3D Imaging and Motion Analysis:** Evaluates structural conformation and biomechanics.
- **Data Analytics:** Big data methods assess breeding outcomes and predict performance trends.

Conclusion

Akhalteke horses represent both a cultural treasure and a focus of scientific study in equine breeding. Integrating traditional breeding methods with modern genetics, biomechanics, and digital monitoring enhances their performance, morphology, and overall quality. Future advancements in technology and genetics will ensure that Akhalteke horses remain a symbol of Turkmenistan's heritage while excelling in sports and international recognition.

References:

1. Golowkin, K. Morphology and Genetics of Akhalteke Horses. Ashgabat, 2018.
2. Amanov, M. Equine Breeding Practices in Turkmenistan. Ashgabat, 2016.
3. Saparow, O. Performance and Training of Akhalteke Horses. Ashgabat, 2020.

©Gurbanmyradova U., Tillayeva A., Samykova G., 2026

Gurbanmyradova Urukjema,

Lecturer

Annaberdiyeva Merjen,

Student

International Horse breeding academy named after Aba Annayev

Meredova Aysona,

Student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

AKHALTEKE HORSES IN INTERNATIONAL EQUESTRIAN SPORTS AND BREEDING PROGRAMS

Abstract

Akhalteke horses are one of the oldest and most prestigious horse breeds in the world, renowned for their speed, endurance, and unique elegance. This article examines their role in international equestrian sports, modern breeding programs, and global recognition. Emphasis is placed on the integration of scientific breeding methods, performance evaluation, and international standards in promoting Akhalteke horses worldwide. The paper also discusses the cultural and economic significance of exporting the breed and participating in competitions.

Keywords:

Akhalteke horses, equestrian sports, horse breeding, international competitions, performance evaluation, genetics, Turkmenistan heritage.

Introduction

The Akhalteke horse is a national symbol of Turkmenistan, celebrated for its beauty, stamina, and intelligence. Beyond national significance, Akhalteke horses are increasingly involved in international equestrian sports and breeding programs. Their participation in global competitions highlights not only their athletic capabilities but also Turkmenistan's commitment to preserving and promoting this unique breed.

International exposure requires integrating modern breeding technologies, performance analytics, and standardized training methods. This ensures that Akhalteke horses remain competitive on the global stage while maintaining their distinct characteristics.

Morphological and Performance Features

1. Physical Attributes:

- Slim yet muscular body structure, long legs, and well-arched neck
- Refined head with expressive eyes and alert ears
- Strong and flexible joints for endurance and agility
- Distinct coat colors, often metallic or glossy

2. Performance Capabilities:

- Exceptional speed for racing and endurance challenges
- High adaptability to diverse terrains and climates
- Graceful movements suited for dressage and show competitions

3. Genetic Considerations:

- Selection ensures preservation of superior traits for speed, stamina, and temperament
- Genetic testing is employed to prevent inbreeding and maintain breed purity

Akhalteke Horses in International Equestrian Sports

- **Endurance Racing:** Akhalteke horses excel in long-distance races, combining speed, stamina, and strategy.

- **Dressage and Show Competitions:** Their agility and elegance make them ideal for international dressage events.

- **Global Recognition:** Participating in competitions worldwide increases awareness of the breed and showcases Turkmenistan's equestrian heritage.

Breeding Programs and Technological Integration

1. Selection and Evaluation:

- Morphological assessment, performance data, and genetic testing are combined to select breeding stock.

- International breeding standards are applied to maintain competitiveness.

2. Digital Monitoring and Analytics:

- GPS tracking, heart rate monitors, and motion sensors optimize training and health management.

- Big Data and AI tools help analyze performance trends and breeding outcomes.

Conclusion

Akhalteke horses are not only a national treasure but also a breed with significant global potential in equestrian sports and breeding programs. Combining traditional breeding wisdom with modern genetics, digital monitoring, and international standards ensures that Akhalteke horses maintain their unique characteristics while excelling in global competitions. Their success enhances Turkmenistan's cultural prestige, supports economic growth, and promotes international collaboration in horse breeding.

References:

1. Golowkin, K. Akhalteke Horses: Morphology and Genetics. Ashgabat, 2018.
2. Amanov, M. Turkmen Horse Breeding Practices and International Standards. Ashgabat, 2019.
3. Saparow, O. Performance Evaluation of Akhalteke Horses in Sports. Ashgabat, 2020.
4. International Equestrian Federation (FEI). Horse Breeding and Competition Guidelines. Lausanne, 2021.
5. Babanazarowa, A. Technological Integration in Modern Horse Breeding. Ashgabat, 2021.

©Gurbanmyradova U., Annaberdiyeva M., Meredova A., 2026



ЭКОНОМИКА И УПРАВЛЕНИЕ

Doan Thi Nhiem¹,Tran Thi Dieu²,¹MienTrung University of Civil Engineering²MienTrung Industry and Trade college

Vietnam

THE DEVELOPMENT OF THE DROPSHIPPING MODEL IN SUPPLY CHAINS

Abstract

Dropshipping has emerged as a prominent fulfillment model in both e-commerce and supply chain management, allowing retailers to operate without holding physical inventory while relying on upstream suppliers for order fulfillment. Initially adopted as a cost-saving mechanism in online retailing, dropshipping has gradually evolved into a strategic distribution approach within modern supply chains. This paper examines the development of the dropshipping model from a supply chain perspective, focusing on its roles in inventory risk management, operational flexibility, and cost efficiency. Drawing on prior literature, the study discusses how dropshipping reshapes coordination among retailers, suppliers, and logistics providers, while also addressing challenges related to service quality and sustainability. The paper concludes by outlining managerial implications and future research directions for integrating dropshipping into supply chain designs.

Keywords:

dropshipping; logistics; supply chain management; inventory risk management; sustainable supply chains.

1. Introduction

In recent years, the rapid expansion of e-commerce and digital platforms has fundamentally transformed the structure and operation of supply chains. Among various fulfillment models, dropshipping has gained increasing attention as an alternative to traditional inventory-based retailing. Under this model, retailers accept customer orders without holding stock, while suppliers or manufacturers are responsible for inventory storage and direct delivery to end customers. By decoupling sales activities from inventory ownership, dropshipping alters conventional cost structures, risk allocation, and coordination mechanisms within the supply chain.

While early studies primarily examined dropshipping as an operational choice in e-commerce environments, recent disruptions in global supply chains have prompted a broader reconsideration of its strategic role. Beyond cost reduction, dropshipping has been increasingly viewed as a flexible distribution mechanism that enhances supply chain responsiveness and adaptability. However, the model also introduces new challenges related to service quality control, information transparency, and sustainability performance.

Against this background, this paper aims to examine the development of the dropshipping model in modern supply chains. By synthesizing existing literature, the study analyzes the evolving roles of dropshipping in inventory risk management, operational performance, and sustainable supply chain design. In doing so, the paper contributes to the growing body of research by positioning dropshipping not merely as an e-commerce fulfillment option but as a strategic component of contemporary supply chain configurations.

2. Theoretical background

2.1. Theory of dropshipping

Dropshipping is a retail business model in which the seller accepts customer orders without holding inventory. Instead, the seller forwards the order details and customer shipping information to a manufacturer,

wholesaler, another retailer, or a fulfillment center, which then ships the products directly to the customer. The seller is responsible for marketing and selling the products, but does not control product quality, storage, inventory management, or product transportation (Kale Sirin, 2020).

2.2. The development of dropshipping

The United States is widely regarded as the first country in which the dropshipping model emerged and developed. The fundamental principle of direct shipment from manufacturers to end customers appeared early in catalog-based retailing practices in the United States, before the advent of electronic commerce. Supported by a large domestic market, advanced logistics infrastructure, and the rapid diffusion of the Internet, dropshipping was gradually digitized and expanded globally, becoming an important model in modern e-commerce and supply chain systems.

- Early formation stage (pre-1990s)

Dropshipping did not originate with the emergence of e-commerce. Its core principle—direct shipment from manufacturers or suppliers to customers without retailer inventory holding—can be traced back to traditional commerce. During this period, catalog-based selling allowed retailers to forward customer orders directly to manufacturers for fulfillment. However, limited information technology capabilities and underdeveloped logistics systems constrained the scale of adoption, preventing dropshipping from being recognized as an independent business strategy.

- Development alongside e-commerce (1990–2000)

The rapid growth of the Internet in the 1990s provided a critical foundation for the development of dropshipping. Early e-commerce websites enabled firms to reach broader markets without expanding physical retail networks. Consequently, dropshipping was primarily adopted as an order fulfillment option aimed at reducing inventory and operational costs. Nevertheless, its diffusion remained limited due to immature electronic payment systems and logistics services.

- Expansion and popularization (2000–2010)

From the early 2000s, the expansion of e-commerce platforms and logistics services facilitated the wider adoption of dropshipping worldwide. The emergence of major online marketplaces such as Amazon and eBay enabled individuals and small firms to engage in online retailing with minimal investment in inventory. During this period, dropshipping became increasingly recognized as a distinct online retail model, although challenges related to service quality and delivery performance persisted.

- Platform-driven boom (2010–2020)

The period from 2010 to 2020 marked a significant boom in dropshipping. The rise of e-commerce infrastructure platforms such as Shopify and WooCommerce, together with advancements in electronic payments and international logistics, substantially lowered entry barriers. Despite its rapid diffusion, intensified competition and ease of imitation resulted in declining profit margins for many dropshipping businesses.

- Transition toward a supply chain perspective (since 2020)

Since 2020, particularly amid global supply chain disruptions, dropshipping has increasingly been viewed as a distribution strategy within broader supply chain management frameworks. Firms now adopt dropshipping not only to reduce inventory but also to enhance flexibility, resilience, and logistics efficiency. Current trends indicate a growing integration of dropshipping with digital technologies, data analytics, and sustainability-oriented supply chain practices, reflecting its evolution into a strategic distribution solution.

2.3. The roles of dropshipping

Dropshipping has gained increasing attention in supply chain and e-commerce research as its application extends beyond a simple fulfillment mechanism toward a strategic distribution approach. Within supply chain systems, dropshipping influences multiple performance dimensions by altering inventory

ownership structures, reallocating operational risks, and reshaping coordination between retailers, suppliers, and logistics providers. Prior studies suggest that these structural changes affect inventory risk exposure, cost efficiency, operational performance, service levels, and sustainability outcomes. Accordingly, the role of dropshipping can be examined through its implications for inventory risk management, operational and service performance, and sustainable supply chain development, providing a comprehensive framework for understanding its strategic relevance in contemporary supply chains. The roles of dropshipping are discussed below with reference to key dimensions of supply chain performance.

- Role of dropshipping in e-commerce environments

The role of dropshipping becomes particularly prominent in e-commerce environments, where real-time order information and demand data can be effectively transmitted and processed. Khouja and Stylianou (2009) argue that dropshipping performs efficiently in e-commerce settings due to the integration of information systems between retailers and suppliers, which enhances coordination in order fulfillment processes.

From an academic perspective, the role of dropshipping extends beyond cost reduction to encompass enhanced operational flexibility for online retailers. Specifically, dropshipping enables firms to rapidly expand product assortments without making proportional investments in physical warehousing infrastructure, thereby making it an attractive fulfillment option in highly competitive digital markets.

- Role in inventory risk management and cost efficiency

A recurring theme in the literature concerns the role of dropshipping in mitigating inventory-related risks. By eliminating the need for retailers to hold physical inventory, dropshipping reduces retailers' exposure to risks associated with product obsolescence, demand volatility, and excess stock accumulation.

However, prior studies caution that while inventory risk is substantially reduced at the retail level, it is not eliminated from the supply chain as a whole. Instead, inventory-related risks are reallocated to upstream suppliers, thereby increasing their operational burden. This redistribution of risk underscores the critical importance of effective coordination mechanisms, information sharing, and contractual arrangements to maintain overall supply chain efficiency.

- Operational performance and service level implications

From an operational perspective, dropshipping has the potential to streamline distribution channels and enhance market responsiveness. Prior studies indicate that when upstream suppliers possess strong logistics and fulfillment capabilities, dropshipping can lead to improved delivery performance and higher levels of customer satisfaction (Wang et al., 2014).

Nevertheless, empirical evidence also suggests that dropshipping may adversely affect service quality when suppliers lack sufficient fulfillment capacity or when coordination failures occur between supply chain partners. As a result, the effectiveness of dropshipping in improving operational performance is highly contingent upon supplier reliability, fulfillment competence, and the degree of information transparency across the supply chain.

- Role of dropshipping in sustainable supply chains

Recent studies have increasingly examined dropshipping through the lens of sustainable supply chain management. By reducing redundant inventory holdings and warehousing activities, dropshipping may contribute to improved resource efficiency and lower environmental impacts. However, the literature also highlights potential sustainability trade-offs, particularly in relation to increased transportation emissions arising from fragmented and dispersed shipping patterns.

Accordingly, the role of dropshipping in promoting sustainability remains highly context-dependent. Its environmental performance is contingent upon alignment with green logistics practices, transportation consolidation strategies, and the optimization of distribution networks.

3. Benefits and limitations of the dropshipping model

Existing studies identify several benefits and limitations associated with the dropshipping model, reflecting its dual impact on supply chain performance.

3.1. Benefits of drop-shipping

- *Low initial investment requirements.* Dropshipping requires relatively low initial capital investment, as retailers do not need to purchase products in advance or maintain physical inventory. Products are procured only after customer orders and payments are received, which significantly lowers financial entry barriers and makes the model accessible to small firms and new market entrants.

- *Favorable cash flow structure.* The dropshipping model supports a positive cash flow cycle, since customer payments are typically received prior to product delivery. Additionally, payment terms negotiated with suppliers may further improve liquidity, reducing the need for immediate cash expenditures.

- *Geographical and operational flexibility.* By eliminating the need for inventory storage and physical retail locations, dropshipping enables firms to operate with minimal geographical constraints. This flexibility allows retailers to manage operations remotely and access global markets through digital platforms.

- *Expanded product assortment.* Dropshipping allows retailers to offer a wide variety of products by sourcing from multiple suppliers. As firms are not constrained by inventory capacity or storage costs, they can rapidly adjust and expand product assortments in response to market demand.

- *Reduced inventory-related risks.* The absence of physical inventory substantially reduces risks related to overstocking, product obsolescence, and forced price markdowns. As a result, retailers face lower exposure to losses arising from demand uncertainty.

- *Potential improvements in delivery efficiency.* In certain contexts, dropshipping may shorten delivery lead times by enabling direct shipment from manufacturers or upstream suppliers to end customers, bypassing intermediary retail warehouses. When supported by capable supplier logistics, this structure can enhance distribution efficiency.

3.2. Limitations of drop-shipping

- *Higher product costs and reduced profit margins.* In a dropshipping arrangement, suppliers bear the costs of product procurement, inventory storage, distribution centers, labor, and related operational activities. These costs are typically embedded in the unit prices charged to retailers, who purchase products on a per-order basis. As a result, dropshipping retailers often face higher procurement costs compared to traditional bulk purchasing, which may lead to reduced profit margins.

- *Limited control over product quality.* Dropshipping retailers generally do not own or physically handle the products they sell, as inventory is controlled and shipped directly by suppliers. This lack of physical inspection limits retailers' ability to monitor product quality, packaging conditions, and handling practices, potentially increasing the risk of customer dissatisfaction.

- *Challenges in return and after-sales management.* Responsibility for handling product returns and after-sales services can become ambiguous in dropshipping arrangements. In practice, coordination issues may arise between retailers, suppliers, and logistics providers, leading to delays or disputes over return processing and customer support responsibilities.

- *Dependence on supplier fulfillment performance.* Delivery times in dropshipping models are largely determined by suppliers' fulfillment and logistics capabilities. Retailers have limited control over shipping speed and reliability, which may negatively affect service levels, particularly when suppliers experience operational disruptions.

- *Increased logistics complexity and shipping costs.* When customer orders include multiple products sourced from different suppliers, shipments may be fragmented across multiple locations. This fragmentation can increase transportation costs, prolong delivery times, and complicate order tracking,

thereby reducing overall distribution efficiency.

Taken together, these benefits and limitations suggest that the effectiveness of dropshipping is highly context-dependent and contingent upon supply chain coordination and governance mechanisms.

4. Emerging trends in dropshipping within supply chain contexts

Recent developments indicate that dropshipping is undergoing a significant transformation from a stand-alone e-commerce fulfillment option to an integrated component of supply chain strategy. Several key trends characterize this evolution.

- Strategic integration of dropshipping into supply chain design

Rather than operating independently, dropshipping is increasingly embedded within broader supply chain configurations. Firms combine dropshipping with traditional warehousing or fulfillment models to enhance flexibility and improve responsiveness to fluctuating market demand. This hybrid approach allows organizations to balance inventory efficiency with service-level performance.

- Growing reliance on logistics service providers and third-party logistics (3PL)

The role of logistics partners has become increasingly critical in contemporary dropshipping arrangements. Firms rely more heavily on professional third-party logistics providers not only for transportation but also for inventory coordination, order processing, and value-added logistics services. This expanded role of 3PLs contributes to improved operational efficiency and coordination across the supply chain.

- Adoption of digital technologies and data-driven decision making

Digital technologies play a pivotal role in the advancement of dropshipping within supply chains. The adoption of supply chain management systems, artificial intelligence, and big data analytics enables firms to improve demand forecasting, optimize material flows, and reduce the risk of supply chain disruptions. These technologies support real-time visibility and enhance coordination among supply chain partners.

- Alignment with sustainability objectives

Current trends in dropshipping are increasingly aligned with sustainability goals. Firms emphasize transportation optimization, emission reduction, and the use of environmentally friendly packaging materials to mitigate environmental impacts. As a result, dropshipping is progressively incorporated into sustainable supply chain strategies aimed at balancing economic performance with environmental and social responsibility.

- Enhanced focus on risk management and supply chain resilience

Recent global disruptions have underscored the importance of building resilient and adaptive supply chains. Dropshipping is evolving toward greater diversification of suppliers, decentralized sourcing structures, and the development of contingency plans to reduce vulnerability to disruptions. These practices strengthen supply chain resilience and improve firms' ability to respond to uncertainty.

Overall, the development of dropshipping within supply chain contexts reflects a broader shift from its traditional role as an online retail mechanism toward a strategic distribution approach. Through deeper integration into supply chain systems, dropshipping contributes to improved operational efficiency, enhanced flexibility, and progress toward sustainable and resilient supply chain management.

5. Recommendations and conclusion

5.1. Recommendations

Based on the analysis, five core recommendations are proposed to enhance the effectiveness of dropshipping within contemporary supply chain systems.

- Supplier selection and quality control. Given the central role of suppliers in inventory holding, order fulfillment, and product quality, firms should prioritize the selection of reliable suppliers with stable production capabilities and standardized logistics operations. Performance governance mechanisms-such as

delivery reliability, defect rates, and customer satisfaction indicators-should be complemented by clear quality standards and periodic supplier audits. These measures are essential to mitigate quality risks and ensure consistent service performance.

- *Supply chain coordination and information transparency.* Effective dropshipping requires strong coordination among retailers, suppliers, and logistics providers. Transparent information sharing related to inventory availability, order status, and demand forecasts reduces information asymmetry and operational delays. In addition, clearly defined and coordinated return and complaint-handling processes are necessary to minimize service failures and protect corporate reputation.

- *Digital integration and data-driven management.* The adoption of information technology, automated order management systems, and data analytics plays a critical role in managing dropshipping operations within complex supply chains. Real-time visibility, system integration, and data-driven decision making enhance demand forecasting accuracy, improve operational control, and increase responsiveness to market fluctuations.

- *Hybrid distribution strategies and logistics optimization.* Rather than relying exclusively on dropshipping, firms are advised to adopt hybrid distribution configurations that combine dropshipping with partial inventory holding or third-party fulfillment for high-demand products. Logistics optimization-including strategic warehouse location of suppliers, regional allocation of inventory, and careful selection of logistics partners with wide coverage and reliable delivery performance-can shorten lead times, reduce transportation costs, and improve customer experience.

- *Sustainability orientation and supply chain resilience.* Dropshipping strategies should be aligned with sustainability objectives and risk management considerations. Transportation optimization, environmentally responsible logistics practices, supplier diversification, and contingency planning contribute not only to reduced environmental impact but also to enhanced supply chain resilience in the face of disruptions.

5.2. Conclusion

This study highlights that dropshipping should be understood not merely as a short-term e-commerce fulfillment option, but as a strategic distribution approach embedded within broader supply chain systems. The effectiveness of dropshipping is contingent upon coordinated interactions among supply chain actors, particularly suppliers, logistics service providers, and retailers. Effective governance of supplier relationships, information integration, and logistics optimization emerges as critical in achieving consistent operational performance.

Furthermore, the findings suggest that the strategic deployment of dropshipping can contribute to enhanced flexibility and efficiency in supply chains, while also supporting sustainability and resilience objectives when aligned with appropriate managerial practices. These insights underscore the need for firms to adopt a systemic and long-term perspective when implementing dropshipping strategies, and they provide a foundation for future research examining the performance implications of dropshipping across diverse supply chain contexts.

References:

1. Brahami Menaouer et al. (2021). The Role of Drop Shipping in E-Commerce. *International Journal of E-Business Research*.
2. Kale Sirin (2020), *Wired*.
3. Khalil, I. (2017). Advantages and Disadvantages of Drop-shipping. *A Young Scientist*, 7. Pages 410–420.
4. Khouja, M., & Stylianou, A. C. (2009). Benefits of virtual channel partnerships: The dropshipping case. *International Journal of Retail & Distribution Management*, 37(7). Pages 561–570.
5. Maryam Asif (2024). The history and evolution of drop shipping: An exploratory study. *An International Journal of Islamic and Social Sciences*. Volume: 04, Issue: 01, 2024. Pages: 28-34.

6. Mark Koroljov (2023). E-commerce: Dropshipping business model. Thesis. Laurea University of Applied Sciences.
7. Moutaz J. Khouja (2001). The evaluation of the drop shipping option for e-commerce retailers. *Computer & Industrial Engineering*, Volume 41, Issue 2. Pages 109-126.
8. Wang, Y., Wallace, S. W., Shen, B., & Choi, T. M. (2014). Service supply chain management: A review of operational models. *European Journal of Operational Research*, 237(1). Pages 1–14.

© Doan Thi Nhiem, Tran Thi Dieu, 2026



ФИЛОЛОГИЯ

Altyyeva Ayjema, lecturer

Pedagogical school named after Aman Kekilov

Ashgabat, Turkmenistan

Chayyrov Annadurdy, lecturer

Yoldashov Guvanch, student

International Horse breeding academy named after Aba Annaev

Kakabayeva Ogulmengli, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

THE TURKMEN LANGUAGE: CULTURAL HERITAGE AND MODERN DEVELOPMENT

Abstract

This article examines the Turkmen language, its historical development, cultural significance, and current status in society. Turkmen is a member of the Turkic language family and serves as the national language of Turkmenistan. The paper discusses its phonetic, lexical, and grammatical features, its role in preserving cultural identity, and efforts to modernize and promote the language in education, media, and public life.

Keywords:

Turkmen language, Turkic languages, national identity, linguistic development, education, culture.

Introduction

The Turkmen language is an essential component of Turkmenistan's national identity and cultural heritage. As part of the Turkic language family, it shares linguistic similarities with other Central Asian languages while maintaining unique phonetic and grammatical features.

Throughout history, the Turkmen language has preserved oral literature, folk tales, poetry, and historical narratives, serving as a medium for transmitting cultural values and traditions. Today, it is the language of education, governance, media, and literature, reflecting both historical continuity and modern development.

Historical and Linguistic Background

Turkmen evolved from Oghuz Turkic dialects and has been influenced by Persian, Arabic, and Russian languages through historical interactions. Its writing system has changed several times:

- **Arabic script** before the 1920s
- **Latin-based script** in the 1920s–1940s
- **Cyrillic script** during the Soviet era
- **Return to Latin script** after independence in 1991

These script reforms reflect the adaptability of the language to social and political changes while ensuring continuity in literacy and education.

Features of the Turkmen Language

1. **Phonetics and Pronunciation:** Turkmen has vowel harmony and specific consonant rules typical of Turkic languages.
2. **Grammar:** Agglutinative structure allows the use of suffixes to convey grammatical functions. Word order is generally Subject-Object-Verb (SOV).
3. **Vocabulary:** Rich in native Turkic words, with loanwords from Persian, Arabic, and Russian, reflecting historical and cultural interactions.

4. **Literature and Oral Traditions:** Folk epics, proverbs, riddles, and poetry preserve cultural knowledge and ethical norms.

Modern Development and Preservation

The Turkmen language continues to adapt to modern society:

- **Education:** Turkmen is the primary language of instruction in schools and universities. Language programs promote literacy and advanced studies.

- **Media:** Television, radio, and digital platforms use Turkmen to reach wider audiences and preserve linguistic heritage.

- **Cultural Promotion:** Literature, poetry, and music are actively used to maintain the richness of the language and its expressive capabilities.

Government initiatives encourage the correct use of the Turkmen language while integrating modern terminology for science, technology, and international communication.

Challenges

Despite progress, challenges remain:

- Balancing modernization with preservation of traditional vocabulary and idioms.
- Ensuring consistent language education across urban and rural regions.
- Integrating Turkmen in digital technologies and scientific publications.

Addressing these challenges is crucial for sustaining the vitality and functionality of the language in all domains of society.

Conclusion

The Turkmen language is both a historical treasure and a living means of communication. It embodies the cultural identity of Turkmen people, supports education, and facilitates modern development. Efforts to preserve, modernize, and promote the language are essential for maintaining national heritage while adapting to the demands of contemporary society.

References:

1. Annammukhamedov, A. Turkmen Language and Cultural Heritage. Ashgabat, 2016.
2. Atayeva, G. Grammar and Vocabulary of the Turkmen Language. Ashgabat, 2018.
3. UNESCO. Atlas of the World's Languages in Danger. Paris, 2019.
4. Niyazov, K. History of the Turkmen Language. Ashgabat, 2017.
5. Babanazarova, M. Modern Turkmen Language in Education and Media. Ashgabat, 2020.

©Altyyeva A., Chayyrov A., Yoldashov G., Kakabayeva O., 2026

Nguyen Thi Cuc

Hanoi University of Mining and Geology, Vietnam

**PRAGMATIC EQUIVALENCE IN ENGLISH-VIETNAMESE TRANSLATION: A QUALITATIVE ANALYSIS
OF CULTURAL, INTERPERSONAL, AND IMPLICATURE SHIFTS**

Abstract

Pragmatic meaning is a crucial yet often overlooked aspect of translational equivalence. Successful translation relies not only on lexical or syntactic accuracy but also on preserving implied meanings, cultural assumptions, and interpersonal nuances. This study examines pragmatic equivalence in English-Vietnamese

and Vietnamese-English translation through qualitative analysis of 150 bilingual examples from literary texts, media discourse, everyday interaction, and machine translation. Drawing on speech act theory, politeness theory, and Gricean implicature, the research identifies three main types of pragmatic shift: cultural shifts, interpersonal (politeness) shifts, and implicature distortion. Pragmatic differences commonly occur when cultural knowledge is not shared, politeness systems differ structurally, or inferred meanings are translated too literally. The study proposes key strategies - cultural adaptation, controlled explicitation, register adjustment, and pragmatic compensation - to reduce pragmatic loss.

Keywords:

Pragmatic equivalence; Cultural shifts; Politeness; Implicature; Translation strategies; Machine translation.

1. Introduction

Translation is a form of mediated communication in which meaning is shaped by context rather than mechanically transferred between languages. Beyond semantic accuracy, pragmatic meaning - speaker intention, interpersonal stance, and inferred significance - often determines communicative success. A translation may be lexically correct yet pragmatically inappropriate if it alters levels of directness, politeness, or cultural resonance.

Pragmatic equivalence, therefore, focuses on communicative effect rather than propositional content, asking whether target readers can derive interpretations similar to those of the source audience. This issue is especially significant in English -Vietnamese translation due to differences in encoding social relations, indirectness, and cultural conventions.

Despite recognition of pragmatics in translation theory, systematic empirical classifications of pragmatic shifts remain limited for this language pair. This study examines bilingual data to identify recurrent patterns of pragmatic divergence and proposes strategies to reduce pragmatic loss. It addresses three questions: how pragmatic meaning shifts, which shifts are most consequential, and which strategies can best maintain pragmatic equivalence.

2. Literature review

Pragmatics, broadly defined as the study of meaning in context (Yule, 1996), emphasises that utterances perform actions and index social relationships. When applied to translation, this perspective entails that translators must reconstruct illocutionary force rather than merely semantic content (Hatim & Mason, 1990). Speech act theory (Austin, 1962; Searle, 1969) provides the foundation for analysing how utterances function as requests, refusals, apologies, or suggestions. Politeness theory (Brown & Levinson, 1987) highlights the management of face and social distance, which are encoded differently across languages. Gricean conversational implicature (Grice, 1975) further demonstrates that speakers routinely convey meanings indirectly, relying on shared assumptions and inferential reasoning, posing a significant challenge for translation.

The concept of pragmatic equivalence is thus intimately concerned with preserving the inferential potential and illocutionary force of utterances (Baker, 2018). It requires sensitivity to culture-specific knowledge, interpersonal alignment, and conventions of indirectness. Scholars such as House (2015), with her Functional-Pragmatic Model of Translation Quality Assessment, emphasise comparing source and target texts based on pragmatic variables, such as social role relationships, levels of politeness, and register. In cross-linguistic contexts where politeness systems are structurally divergent, pragmatic meaning cannot be transferred through formal correspondence alone (Kecskes, 2014). Vietnamese, for instance, encodes social hierarchy and relational stance through a rich system of pronouns, address terms, and sentence-final particles, which operates on principles structurally distinct from those of English. In contrast, English often

relies on modal verbs, hedging devices, and syntactic indirectness to convey subtlety (Blum-Kulka, House, & Kasper, 1989). These asymmetries create a systematic risk for pragmatic shift.

Although theoretical discussions of pragmatic translation abound (e.g., Gutt, 1991; Hickey, 1998), empirical studies that systematically classify pragmatic shifts and link them to concrete translation strategies for the English-Vietnamese pair remain relatively scarce. However, there remains a need for a comprehensive analytical framework that integrates the three key pragmatic pillars: culture, interpersonal relations, and implicature. The present study seeks to address this gap by providing a data-grounded taxonomy and linking it to practicable translation strategies.

3. Methodology

This study employs a qualitative descriptive design to examine patterns of pragmatic shift in translation. The dataset includes 150 bilingual examples drawn from literary dialogue, media discourse, everyday conversation, and machine translation outputs, ensuring a range of registers and communicative contexts.

Examples were selected for pragmatic relevance, such as culture-specific expressions, politeness markers, indirect speech acts, and implicatures, while cases involving only lexical or grammatical differences were excluded.

Analysis focused on three dimensions: cultural pragmatics, interpersonal pragmatics, and implicature. For each example, the source meaning was identified, the target rendering examined, and the shift classified as preserved, attenuated, transformed, or adapted. A subset of the data was cross-checked by bilingual reviewers to enhance reliability.

4. Findings and discussion

4.1. Three categories of pragmatic shifts

The analysis reveals three recurrent categories of pragmatic shift: cultural pragmatic shifts, interpersonal (politeness) shifts, and implicature-related shifts. Notably, many problematic translations involve pragmatic misalignment rather than semantic inaccuracy, in which alterations in directness, interpersonal stance, or cultural signalling reshape communicative interpretation.

4.1.1. Cultural pragmatic shifts

Cultural pragmatic shifts occur when expressions grounded in shared sociocultural knowledge fail to activate equivalent associations in the target context. Literal transfer may preserve propositional meaning while attenuating evaluative or affective resonance. For instance, the Vietnamese idiomatic expression “sớm nắng chiều mưa,” which describes instability or unpredictability, is sometimes rendered literally as “sunny in the morning, rainy in the afternoon.” While semantically transparent, the English version does not convey the conventional evaluative meaning of ‘inconsistency’. A functionally equivalent rendering, such as “highly changeable” or “very unpredictable”, better preserves the pragmatic effect. This pattern demonstrates that cultural meaning resides not in imagery itself but in its conventionalised interpretation.

A similar issue arises in routine interactional formulas. The Vietnamese greeting “Ăn cơm chưa?” often functions as a rapport-building device rather than a literal inquiry about food consumption. Translating it as “Have you eaten rice yet?” may be pragmatically odd in English, where such specificity suggests genuine concern about diet. A contextually appropriate equivalent, such as “Have you eaten?” or “How are you—have you had lunch?” maintains its phatic function. These cases illustrate how pragmatic equivalence requires the reconstruction of communicative purpose rather than lexical form.

4.1.2. Interpersonal shifts

Interpersonal shifts arise from cross-linguistic asymmetries in politeness encoding. Vietnamese heavily encodes relational stance through pronouns and particles, whereas English relies more on modality and syntactic mitigation. Failure to recalibrate these resources can alter interpersonal force.

Consider the workplace request “Anh/chị gửi giúp em file này với ạ.” A literal translation, such as “Send

me this file,” removes multiple Vietnamese mitigation devices (giúp, với, ạ), resulting in an utterance that may sound directive or abrupt in English. A pragmatically aligned version, “Could you please send me the file when you have a moment?”, restores mitigation through modal verbs and temporal softeners. The shift illustrates how politeness meaning is distributed across different linguistic resources in each language.

Conversely, English politeness formulas may not map naturally onto Vietnamese structures. The phrase “I’m afraid we can’t process your request at the moment” softens refusal through a conventionalised expression of regret. Rendering this literally as “Tôi sợ là...” may sound unnatural or overly formal. A more contextually appropriate translation such as “Rất tiếc, hiện tại bên mình chưa thể xử lý yêu cầu này” employs a Vietnamese service-genre formula that performs equivalent facework. Here, pragmatic equivalence involves substituting culturally appropriate politeness conventions.

4.1.3. *Implicature-related shifts*

Implicature-related shifts occur when indirect utterances are translated propositionally, disrupting the intended inference. For example, the Vietnamese response “Để mình xem đã” often serves as a polite noncommitment or an indirect refusal. A literal translation of “Let me check first” may be interpreted as genuine intent in English. Rendering it as “I’ll see what I can do” or “I’ll see, but I can’t promise” preserves its non-committal implicature.

Understatement-based hints present similar challenges. In English, “It’s a bit crowded in here” may function as a polite request to create space. Translating it as “Ở đây hơi đông” may shift the meaning toward numerical density rather than clutter or spatial discomfort. A pragmatically equivalent rendering such as “Ở đây hơi chật/bừa bộn nh” better reconstructs the intended hint. These examples demonstrate that implicature is preserved not by literal correspondence but by replicating the inferential cues available to the target audience.

4.2. *Strategies for maintaining pragmatic equivalence*

The observed patterns give rise to several pragmatic translation strategies.

Cultural adaptation involves replacing source expressions with target-culture functional equivalents, as in the rendering of “sớm nắng chiều mưa” as “unpredictable.” The goal is to reproduce conventional meaning rather than imagery.

Controlled explicitation selectively introduces cues that support inference. In translating “Để mình xem đã,” adding “I can’t promise” clarifies non-commitment without over-specifying intent.

Register realignment adjusts interpersonal stance. Transforming “Anh/chị gửi giúp em file này với ạ” into “Could you please send me the file when you have a moment?” recalibrates politeness through modal and temporal mitigation.

Pragmatic compensation redistributes pragmatic force when direct transfer is impossible. For instance, additional gratitude (“thanks for inviting me”) may be inserted in English to match the facework embedded in Vietnamese refusal formulas.

Contextual substitution prioritises communicative function over form. Rendering “I’m afraid we can’t...” as “Rất tiếc...” replaces an English politeness formula with a Vietnamese one appropriate to service discourse.

Collectively, these strategies demonstrate that pragmatic equivalence emerges from interpretive alignment rather than structural similarity. Effective translation thus depends on the translator’s ability to anticipate how utterances will be processed within the sociocultural and interpersonal frameworks of the target context.

The findings highlight the centrality of pragmatic competence in translator education. Training should incorporate analysis of interpersonal positioning, cultural schemas, and inferential meaning. For professional practice, the strategies outlined here can serve as diagnostic tools during revision. For machine translation, the study highlights the need to integrate contextual modelling and interpersonal features, as current

systems remain largely proposition-oriented.

5. Conclusion

Pragmatic equivalence constitutes a foundational dimension of translational effectiveness. Through qualitative analysis of bilingual data, this study has identified systematic patterns of cultural, interpersonal, and implicature-related shift. These shifts frequently arise not from semantic error but from the reduction of pragmatic meaning to propositional content. The proposed analytical framework and strategy set offer practical tools for enhancing pragmatic transfer in both human and machine-mediated translation. However, the dataset remains limited and may not cover all genres, especially specialised fields. The qualitative design also lacks experimental validation. Future research should expand the corpus and apply quantitative methods to strengthen the findings.

References:

1. Austin, J. L. (1962). *How to do things with words*. Oxford University Press.
2. Baker, M. (2018). *In other words: A coursebook on translation* (3rd ed.). Routledge.

© Nguyen Thi Cuc, 2026



ПЕДАГОГИКА

Ahmedov Soyench, lecturer

International Horse breeding academy named after Aba Annaev

Bayramova Bagul, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

Ojardurdyev Maksat, student

Magtymguly Turkmen State University

Bahramova Nurana,

Student of the Department of Language Studies, trained in extended groups

International University of Industrialists and Entrepreneurs

Ashgabat, Turkmenistan

THE EDUCATIONAL ENVIRONMENT

Abstract

As of March 2026, the classroom is no longer defined by physical walls but by the seamless integration of digital ecosystems and human cognition. The emergence of Digital Pedagogy—the study and practice of teaching and learning with digital technologies—has revolutionized the 21st-century educational environment. This article explores the transition from "Static Instruction" to "Adaptive Learning," the role of AI-driven personalized curricula, and how immersive technologies like Virtual Reality (VR) create experiential learning hubs. We analyze how 2026-era educators are shifting from "Information Providers" to "Learning Architects" to bridge the gap between traditional rote memorization and the high-level critical thinking required in a digital-first economy.

Keywords:

digital pedagogy, edtech, adaptive learning, artificial intelligence in education (AIED), learning architecture, virtual reality (VR) classroom, data-driven instruction, and hybrid learning environments.

1. The "Adaptive Learning" Architecture

In 2026, the "one-size-fits-all" model of education has been replaced by adaptive systems that respond to the unique cognitive pace of each student.

- **AI-Personalized Pathways:** Instead of synchronized lecturing, digital platforms use machine learning algorithms to adjust the difficulty and style of content in real-time. If a student struggles with a mathematical concept, the system automatically pivots to a visual or gamified explanation.

- **Real-Time Analytics:** Educators now use dashboards that provide an "Emotional and Cognitive Heatmap" of the classroom. These analytics allow teachers to intervene precisely when a student's engagement drops, creating a proactive rather than reactive support system.

2. Immersive Environments and Experiential Learning

One of the most significant pedagogical shifts in 2026 is the use of Extended Reality (XR) to turn abstract theory into tangible experience.

- **Virtual Presence:** Digital pedagogy utilizes VR and Augmented Reality (AR) to transport students to historical sites, the microscopic world of cellular biology, or even distant planetary surfaces. This "Presence-Based Learning" increases retention rates by engaging sensory memory.

- **Digital Twins in Education:** Schools now utilize digital twins of complex systems (like engines or cities). Students can manipulate these models in a risk-free virtual environment, "stacking" practical experience before ever touching physical equipment.

3. The Role of the "Learning Architect"

The shift to digital pedagogy has fundamentally redefined the professional identity of the educator in 2026.

- **Curation Over Delivery:** Since information is ubiquitous, the 21st-century teacher focuses on the curation of high-quality digital resources. They design the *journey* of learning rather than just delivering the *destination* of facts.

- **Collaborative Digital Spaces:** Pedagogy now emphasizes "Connectivism," where learning happens through social networks and digital collaboration tools. Students are taught to navigate "Transmedia Navigation"—the ability to follow stories and information across different digital platforms.

4. Codifying Digital Citizenship and Ethics

In 2026, "Algorithmic Literacy" is being codified into the core curriculum to ensure students can thrive safely in an AI-saturated world.

- **Ethical AI Auditing:** Students earn micro-credentials in identifying deepfakes and understanding bias in AI algorithms. This transforms digital pedagogy from a technical training exercise into a moral and civic one.

- **The Human-Centric Advantage:** As technical execution is increasingly handled by AI, digital pedagogy prioritizes the "Human Edge"—creativity, empathy, and ethical reasoning—which are the most valuable assets in a specialist's professional "stack."

Conclusion: The End of Passive Learning

The educational environment of 2026 is no longer a terminal location but a persistent, digital layer of reality. Digital pedagogy has democratized access to high-level learning, allowing individuals to learn "Just-in-Time" rather than "Just-in-Case." For the student of tomorrow, the digital platform is the foundation, but the pedagogical framework is the skyscraper that reaches toward global competence.

References:

1. EdTech Global Review (Jan 2026). The 2026 Classroom: From Smartboards to AI Mentors.
2. UNESCO Institute for Information Technologies in Education (2025). Standards for AI-Driven Pedagogy.
3. Wired Education (Feb 2026). Why the 'Lecture-First' Model Died in 2024.
4. European Journal of Open, Distance and E-Learning (2025). The Architecture of Connectivism in Digital-First Schools.
5. Microsoft Education (2026). The Impact of Immersive VR on Long-Term Information Retention.

© Ahmedov S., Bayramova B., Ojardurdyev M., Bahramova N., 2026

Charyberdiyev Kakageldi, lecturer

Yoldashov Guvanch, Student

International Horse breeding academy named after Aba Annayev

Jumageldiyeva Orazdursun, student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

DUAL APPROACHES IN MODERN EDUCATION: THEORETICAL AND PRACTICAL TEACHING METHODS

Abstract

Effective education increasingly relies on integrating multiple teaching approaches to enhance student

learning. This article examines dual teaching strategies, combining theoretical instruction and practical application, and explores their benefits in modern educational systems. Emphasis is placed on curriculum design, active learning methods, and technology integration to maximize student engagement and knowledge retention.

Keywords:

dual teaching, theoretical instruction, practical learning, pedagogy, active learning, educational technology.

Introduction

Modern education demands that students not only acquire knowledge but also develop skills to apply that knowledge in real-world contexts. Dual teaching approaches, combining theoretical learning with practical experiences, are increasingly recognized as effective strategies across disciplines.

- **Theoretical instruction** provides foundational knowledge, conceptual frameworks, and analytical skills.

- **Practical teaching** allows students to apply concepts in real-world or simulated environments, enhancing comprehension and problem-solving abilities.

This dual approach ensures that learners develop both cognitive understanding and hands-on competence.

Theoretical Teaching Methods

1. Lecture-Based Learning:

- Organized presentations deliver key concepts, theories, and frameworks.
- Encourages critical thinking through discussion and questioning.

2. Case Studies and Problem-Solving:

- Students analyze scenarios to apply theoretical knowledge.
- Develops reasoning, decision-making, and analytical skills.

3. Collaborative Learning:

- Group discussions, debates, and peer teaching reinforce understanding.
- Promotes communication and teamwork skills.

Practical Teaching Methods

1. Laboratory and Workshop Sessions:

- Students perform experiments or practical exercises to reinforce theoretical principles.
- Example: In veterinary or biology programs, students analyze blood samples or observe anatomical structures.

2. Fieldwork and Internships:

- Provides exposure to real-world environments, professional practices, and community engagement.
- Builds problem-solving skills and professional experience.

3. Simulations and Digital Tools:

- Computer-based simulations, virtual labs, and gamified learning enhance interactive learning.
- Offers safe environments to practice skills without risk.

Benefits of Dual Teaching Approaches

- Bridges the gap between theory and practice.
- Enhances student engagement, motivation, and retention of knowledge.
- Prepares students for professional environments and practical challenges.
- Encourages critical thinking, innovation, and lifelong learning.

Integration of Technology

- **Learning Management Systems (LMS):** Organize lectures, practical exercises, and assessments.

• **Virtual Reality (VR) and Augmented Reality (AR):** Simulate real-world scenarios for immersive learning.

- **Digital Assessment Tools:** Track student progress, provide feedback, and identify learning gaps.

Challenges

- Balancing time and resources between theoretical and practical components.
- Ensuring equal access to technological tools for all students.
- Training educators to effectively integrate dual teaching methods.

Conclusion

Dual teaching approaches, combining theoretical instruction with practical application, are essential for modern education. By integrating active learning strategies, technological tools, and real-world experiences, educators can develop students' knowledge, skills, and professional readiness. Such methods foster holistic learning and prepare students to succeed in academic and professional contexts.

References:

1. Biggs, J., & Tang, C. Teaching for Quality Learning at University. McGraw-Hill Education, 2011.
2. Prince, M. Does Active Learning Work? A Review of the Research. Journal of Engineering Education, 2004.
3. Kolb, D. A. Experiential Learning: Experience as the Source of Learning and Development. Pearson, 2015.
4. Bonwell, C. C., & Eison, J. A. Active Learning: Creating Excitement in the Classroom. ASHE-ERIC Higher Education Reports, 1991.

©Charyberdiyev K., Yoldashov G., Jumageldiyeva O., 2026

Chayyrov Annadurdy,

Lecturer

Amanov Muhammet,

Student

International Horse breeding academy named after Aba Annayev

Bayramgulyyeva Ogultach,

student.

Pedagogical secondary vocational school named after Berdimuhamed Annaev of Arkadag city

Arkadag, Turkmenistan

DUAL TEACHING APPROACHES IN STEM EDUCATION: COMBINING THEORY AND PRACTICE

Abstract

In STEM education, combining theoretical instruction with practical application is essential to develop students' knowledge and problem-solving abilities. This article explores dual teaching approaches in STEM fields, highlighting methods such as lectures, laboratory experiments, simulations, and project-based learning. The integration of technology and active learning techniques enhances understanding, engagement, and readiness for real-world challenges.

Keywords:

dual teaching, STEM education, theoretical learning, practical application, laboratory experiments, simulations, project-based learning.

Introduction

STEM education demands both conceptual understanding and practical skills. Students must not only grasp complex theories but also learn to apply them in realistic scenarios. Dual teaching approaches—combining theory and practice—ensure holistic learning.

- Theoretical learning provides essential frameworks, principles, and analytical skills.
- Practical application reinforces concepts through hands-on experience, experiments, and problem-solving exercises.

By combining these methods, educators prepare students for academic success, professional challenges, and innovation-driven careers.

Theoretical Teaching in STEM

1. Lecture-Based Learning:

- Presents core concepts, principles, and scientific theories.
- Encourages critical thinking through questioning and discussions.

2. Problem-Solving and Case Studies:

- Students analyze problems and design solutions based on theoretical knowledge.
- Enhances analytical reasoning and applied thinking skills.

3. Collaborative Discussions:

- Peer learning, group debates, and brainstorming sessions improve comprehension.
- Develops teamwork and communication skills essential in STEM fields.

Practical Teaching in STEM

1. Laboratory Experiments:

- Chemistry, physics, and biology experiments allow students to apply theoretical principles.
- Example: Observing chemical reactions, measuring forces, or conducting genetic analyses.

2. Simulations and Virtual Labs:

- Computer simulations replicate complex phenomena safely and cost-effectively.
- Allows experimentation with scenarios difficult to reproduce in a real lab.

Conclusion

Dual teaching approaches in STEM education combine theoretical knowledge with practical experience, producing well-rounded students ready for real-world applications. Integrating active learning, technology, and project-based methods strengthens comprehension, engagement, and skill development. This holistic approach prepares students for STEM careers, promotes innovation, and encourages lifelong learning.

References:

1. Prince, M. Does Active Learning Work? A Review of the Research. *Journal of Engineering Education*, 2004.
2. Kolb, D. A. *Experiential Learning: Experience as the Source of Learning and Development*. Pearson, 2015.
3. Biggs, J., & Tang, C. *Teaching for Quality Learning at University*. McGraw-Hill Education, 2011.
4. Bonwell, C. C., & Eison, J. A. *Active Learning: Creating Excitement in the Classroom*. ASHE-ERIC Higher Education Reports, 1991.
5. Bransford, J., Brown, A., & Cocking, R. *How People Learn*. National Academy Press, 2000.

УДК616-092

Мухаммедова Зулейха Реджеповна

Старший преподаватель кафедры патологической физиологии
Государственного Медицинского университета Туркменистана имени
Мырата Гаррыева
Туркменистан, Ашхабад

ПАТОФИЗИОЛОГИЯ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТИ

Аннотация

Сердечная недостаточность является одним из наиболее распространённых патологических состояний сердечно-сосудистой системы и характеризуется неспособностью сердца обеспечивать адекватное кровоснабжение органов и тканей. В основе развития данного синдрома лежит нарушение сократительной способности миокарда, а также изменения гемодинамики и нейрогуморальной регуляции. В статье рассматриваются основные механизмы развития сердечной недостаточности, включая причины её возникновения, изменения в работе сердца, компенсаторные реакции организма и патогенетические механизмы прогрессирования заболевания. Особое внимание уделяется роли нейрогуморальных факторов, нарушению микроциркуляции и развитию системных изменений в организме.

Ключевые слова:

сердечная недостаточность, патофизиология, миокард, гемодинамика,
нейрогуморальная регуляция.

Mukhammedova Zuleikha Rejepovna

Senior Lecturer at the Department of Pathological Physiology
State Medical University of Turkmenistan named after Myrat Garryev
Turkmenistan, Ashgabat

PATHOPHYSIOLOGY OF HEART FAILURE

Abstract

Heart failure is one of the most common pathological conditions of the cardiovascular system and is characterized by the inability of the heart to provide adequate blood supply to organs and tissues. The development of this syndrome is based on impaired myocardial contractility as well as changes in hemodynamics and neurohumoral regulation. This article discusses the main mechanisms of heart failure development, including its causes, changes in cardiac function, compensatory reactions of the body, and pathogenetic mechanisms of disease progression. Special attention is paid to the role of neurohumoral factors, microcirculatory disorders, and systemic changes in the body.

Keywords:

heart failure, pathophysiology, myocardium, hemodynamics, neurohumoral regulation.

Понятие и общая характеристика сердечной недостаточности

Сердечная недостаточность представляет собой патологическое состояние, при котором сердце не способно обеспечивать адекватный минутный объём кровообращения, необходимый для нормального функционирования органов и тканей организма. Это состояние развивается вследствие

нарушения сократительной функции миокарда или увеличения нагрузки на сердце. В результате возникает несоответствие между потребностью тканей в кислороде и питательных веществах и возможностями сердечно-сосудистой системы их доставлять.

Сердечная недостаточность может быть острой и хронической. Острая форма развивается быстро и сопровождается резким ухудшением гемодинамики. Хроническая сердечная недостаточность формируется постепенно и характеризуется длительным прогрессирующим течением. В патофизиологии данного состояния важную роль играют изменения в сократительной функции сердца, нарушение венозного возврата и повышение давления в малом и большом кругах кровообращения.

Кроме того, сердечная недостаточность сопровождается нарушением перфузии тканей, что приводит к гипоксии и метаболическим изменениям в различных органах. Это делает данное состояние системным патологическим процессом, затрагивающим практически все органы и системы организма.

Основные причины развития сердечной недостаточности

Развитие сердечной недостаточности может быть связано с различными заболеваниями сердечно-сосудистой системы. Наиболее частыми причинами являются ишемическая болезнь сердца, артериальная гипертензия, врождённые и приобретённые пороки сердца, а также воспалительные заболевания миокарда. Эти патологические процессы приводят к повреждению сердечной мышцы и нарушению её сократительной способности.

Кроме того, сердечная недостаточность может развиваться при кардиомиопатиях, эндокринных нарушениях и некоторых системных заболеваниях. Важную роль играют факторы, повышающие нагрузку на сердце, такие как хроническая гипертензия, анемия и заболевания лёгких. В этих условиях сердце вынуждено работать с повышенной нагрузкой, что со временем приводит к истощению его функциональных резервов.

Патогенетически все причины сердечной недостаточности можно разделить на две основные группы: поражение миокарда и перегрузка сердца объёмом или давлением. В обоих случаях развивается нарушение насосной функции сердца, что является ключевым механизмом формирования данного патологического состояния.

Нарушения сократительной функции миокарда

Одним из основных патофизиологических механизмов сердечной недостаточности является снижение сократительной способности миокарда. Это может быть связано с повреждением кардиомиоцитов, нарушением энергетического обмена в клетках сердца или изменениями в структуре миокарда.

При повреждении кардиомиоцитов уменьшается количество функционирующих мышечных волокон, что приводит к снижению силы сокращения сердца. Кроме того, нарушается процесс взаимодействия актиновых и миозиновых нитей, что также снижает эффективность сокращения миокарда. Нарушения энергетического обмена в клетках сердца приводят к дефициту аденозинтрифосфата, который необходим для нормальной сократительной активности.

Со временем в миокарде могут развиваться структурные изменения, такие как гипертрофия или дилатация желудочков. Эти изменения являются компенсаторными, однако при длительном течении заболевания они способствуют дальнейшему ухудшению функции сердца.

Изменения гемодинамики при сердечной недостаточности

Сердечная недостаточность сопровождается значительными изменениями гемодинамики. Одним из основных проявлений является снижение сердечного выброса, что приводит к ухудшению кровоснабжения органов и тканей. В ответ на это организм активирует различные компенсаторные

механизмы, направленные на поддержание артериального давления и перфузии жизненно важных органов.

Одновременно с этим происходит повышение давления в венозной системе, что приводит к застою крови в малом или большом круге кровообращения. При левожелудочковой недостаточности развивается застой в лёгких, что может приводить к одышке и развитию отёка лёгких. При правожелудочковой недостаточности наблюдается застой крови в венах большого круга кровообращения, что проявляется отёками и увеличением печени.

Таким образом, гемодинамические изменения являются одним из ключевых факторов развития клинических проявлений сердечной недостаточности.

Компенсаторные механизмы организма

На ранних этапах развития сердечной недостаточности организм активирует ряд компенсаторных механизмов, направленных на поддержание адекватного кровообращения. Одним из таких механизмов является увеличение частоты сердечных сокращений, что позволяет временно поддерживать минутный объём сердца.

Список использованной литературы:

- 1.Патофизиология / Под ред. В. В. Новицкого, Е. Д. Гольдберга. — Москва: ГЭОТАР-Медиа, 2016. — 912 с. — <https://www.geotar.ru>
- 2.Патологическая физиология / Под ред. А. Д. Адо. — Москва: Медицина, 2000. — 640 с. — <https://нэб.рф>
- 3.Патофизиология: учебник / Под ред. В. А. Фролова. — Москва: ГЭОТАР-Медиа, 2018. — 752 с. — <https://www.geotar.ru>
- 4.Патологическая физиология: учебник / П. Ф. Литвицкий. — Москва: ГЭОТАР-Медиа, 2020. — 896 с. — <https://www.geotar.ru>

©Мухаммедова З.Р., 2026



МЕДИЦИНА

Annayeva Ogulgeldi,

senior lecturer of the department of Pathological Physiology
Myrat Garryyev State Medical University of Turkmenistan
Ashgabat, Turkmenistan

INTEGRATED STUDY OF NORMAL AND PATHOLOGICAL PHYSIOLOGY: MECHANISMS AND CLINICAL SIGNIFICANCE

Abstract

Physiology is the cornerstone of medical science, explaining the mechanisms that maintain normal body function, while pathological physiology investigates deviations caused by diseases. This article explores the fundamental principles of normal physiological processes and the pathological alterations that occur in various organ systems, including cardiovascular, respiratory, nervous, and endocrine systems. Emphasis is placed on understanding how disruptions in homeostasis lead to disease, the role of modern diagnostics, and the clinical applications of physiological knowledge in patient management.

Keywords:

physiology, pathological physiology, cardiovascular system, respiratory system, nervous system, endocrine system, homeostasis, clinical applications, diagnostics.

Introduction

The study of normal physiology provides insights into how the human body functions under healthy conditions, maintaining equilibrium through complex interactions among organ systems. Homeostasis, the ability to maintain stable internal conditions despite external changes, is central to normal physiological processes. Conversely, pathological physiology focuses on functional alterations that arise due to diseases, injuries, or genetic abnormalities, disrupting homeostasis and causing clinical manifestations. Understanding both normal and pathological states is essential for medical education, diagnosis, treatment, and research. Clinicians rely on this knowledge to identify early signs of dysfunction, implement preventive measures, and design effective therapeutic strategies tailored to individual patients.

Normal Physiology

Normal physiology encompasses all organ systems working in coordination to sustain life. In the cardiovascular system, the heart functions as a pump, circulating blood to supply oxygen and nutrients to tissues while removing waste products. Blood pressure regulation is achieved through neural and hormonal feedback mechanisms, ensuring adequate perfusion under varying conditions. The respiratory system maintains gas exchange, with oxygen entering the bloodstream in the alveoli and carbon dioxide eliminated from the body. Neural control of respiration adapts ventilation to metabolic demands. The nervous system integrates sensory input with motor output, coordinates reflexes, and regulates involuntary functions, maintaining overall homeostasis. Meanwhile, the endocrine system secretes hormones that control metabolism, growth, reproduction, and stress responses through precisely regulated feedback loops. Proper interaction of these systems guarantees normal physiological function and adaptability to environmental challenges.

Pathological Physiology

Pathological physiology examines how disease disrupts normal function. In the cardiovascular system, hypertension, atherosclerosis, and heart failure alter blood flow dynamics, leading to inadequate tissue perfusion and organ dysfunction. Respiratory disorders, including chronic obstructive pulmonary disease (COPD), asthma, and pneumonia, compromise gas exchange, resulting in hypoxia and carbon dioxide

retention. Neurological disorders, such as stroke, neurodegenerative diseases, and peripheral neuropathies, impair signal transmission, affecting cognition, movement, and autonomic regulation. Endocrine diseases, including diabetes mellitus, thyroid dysfunction, and adrenal insufficiency, disrupt hormonal balance, leading to metabolic imbalances and multi-system complications. In each case, pathological changes interfere with homeostasis, triggering compensatory mechanisms that may further exacerbate disease progression.

Diagnostics and Clinical Applications

Modern diagnostics play a critical role in identifying physiological and pathophysiological alterations. Laboratory analyses, including blood chemistry, hematology, and molecular tests, provide essential information about organ function and disease processes. Imaging techniques, such as MRI, CT, and ultrasound, allow visualization of structural and functional abnormalities. Electrophysiological studies, including ECG, EEG, and EMG, evaluate electrical activity in cardiac and neural tissues.

Conclusion

Normal and pathological physiology form the foundation of medical practice, linking basic science with clinical application. Knowledge of how organ systems function and how diseases disrupt these functions enables healthcare professionals to diagnose accurately, implement effective treatments, and develop preventive interventions. Advances in diagnostic technologies, molecular medicine, and clinical research have enhanced our understanding of pathophysiology, facilitating early detection of disease and personalized patient care. By integrating theoretical knowledge with practical application, medical professionals can maintain health, restore function, and improve outcomes for patients across diverse clinical settings.

References:

1. Guyton, A. C., & Hall, J. E. Textbook of Medical Physiology. Elsevier, 2021.
2. McPhee, S. J., & Hammer, G. D. Pathophysiology of Disease: An Introduction to Clinical Medicine. McGraw-Hill, 2018.
3. Vander, A., Sherman, J., & Luciano, D. Human Physiology: The Mechanisms of Body Function. McGraw-Hill Education, 2019.
4. Koeppen, B. M., & Stanton, B. A. Berne & Levy Physiology. Elsevier, 2018.
5. Hall, J. E. Guyton and Hall Physiology Review. Elsevier, 2020.

© Annayeva O., 2026

Annayeva Ogulgeldi,

senior lecturer of the department of Pathological Physiology
Myrat Garryyev State Medical University of Turkmenistan
Ashgabat, Turkmenistan

NORMAL AND PATHOLOGICAL PHYSIOLOGY: INSIGHTS INTO FUNCTIONAL AND DISEASE STATES

Abstract

Physiology explores the mechanisms of the body's normal function, while pathological physiology examines deviations caused by diseases. This article reviews the fundamental principles of normal and pathological physiology, focusing on cardiovascular, respiratory, nervous, and endocrine systems. Emphasis is placed on the role of modern diagnostic techniques, laboratory analyses, and clinical applications in understanding physiological and pathophysiological conditions.

Keywords:

physiology, pathological physiology, cardiovascular system, respiratory system, nervous system, endocrine system, diagnostics, clinical applications.

Introduction

Understanding how the human body functions under normal and pathological conditions is crucial for healthcare and medical research. Normal physiology ensures homeostasis and adaptation to environmental changes, while pathological physiology examines disruptions leading to disease.

By studying both normal and pathological states, healthcare professionals can develop effective treatment strategies, preventive measures, and personalized medical care.

Principles of Normal Physiology**1. Cardiovascular System:**

- Maintains blood circulation, oxygen transport, and tissue perfusion.
- Regulated by autonomic nervous system, baroreceptors, and hormones.

2. Respiratory System:

- Facilitates oxygen uptake and carbon dioxide removal.
- Controlled by neural and chemical feedback mechanisms.

3. Nervous System:

- Coordinates voluntary and involuntary functions.
- Integrates sensory input with motor responses.

4. Endocrine System:

- Hormones regulate metabolism, growth, stress response, and reproduction.
- Feedback loops maintain hormonal balance.

Pathological Physiology**1. Cardiovascular Disorders:**

- Hypertension, atherosclerosis, and heart failure disrupt normal circulation.
- Pathological changes affect cardiac output and blood pressure regulation.

2. Respiratory Disorders:

- Chronic obstructive pulmonary disease (COPD), asthma, and pneumonia impair gas exchange.
- Structural and functional abnormalities cause hypoxia and hypercapnia.

3. Nervous System Disorders:

- Stroke, multiple sclerosis, and neuropathies interfere with signal transmission.
- Functional impairments affect cognition, motor skills, and autonomic control.

Conclusion

Normal and pathological physiology is fundamental to medicine, providing insights into how the body functions and responds to disease. Understanding these mechanisms enables clinicians to diagnose accurately, design effective treatments, and implement preventive strategies. Advances in molecular diagnostics, imaging technologies, and clinical research continue to improve our comprehension of pathophysiological processes and enhance patient care.

References:

1. Guyton, A. C., & Hall, J. E. *Textbook of Medical Physiology*. Elsevier, 2021.
2. Vander, A., Sherman, J., & Luciano, D. *Human Physiology: The Mechanisms of Body Function*. McGraw-Hill Education, 2019.
3. McPhee, S. J., & Hammer, G. D. *Pathophysiology of Disease: An Introduction to Clinical Medicine*. McGraw-Hill, 2018.
4. Koeppen, B. M., & Stanton, B. A. *Berne & Levy Physiology*. Elsevier, 2018.
5. Hall, J. E. *Guyton and Hall Physiology Review*. Elsevier, 2020.

Annayeva Ogulgeldi,

senior lecturer of the department of Pathological Physiology
Myrat Garryyev State Medical University of Turkmenistan
Ashgabat, Turkmenistan

NORMAL AND PATHOLOGICAL PHYSIOLOGY: PRINCIPLES, DIAGNOSTICS, AND CLINICAL APPLICATIONS

Abstract

Physiology studies the functions and mechanisms of the body under normal and pathological conditions. This article explores the fundamental principles of normal physiology, pathological changes, and their clinical implications. Special attention is given to cardiovascular, respiratory, nervous, and endocrine systems. The integration of modern diagnostic methods and molecular techniques in understanding physiological disorders is also discussed.

Keywords:

physiology, pathological physiology, cardiovascular system, respiratory system, nervous system, endocrine system, diagnostics, clinical application.

Introduction

Physiology is a branch of medical science that explains how the body functions under normal conditions, while pathological physiology examines the alterations that occur in disease states. Understanding these principles is crucial for accurate diagnosis, treatment, and management of patients.

Normal physiology ensures homeostasis, maintaining stable internal conditions despite external fluctuations. Pathological conditions disrupt homeostasis, leading to functional impairments and clinical manifestations.

Principles of Normal Physiology

1. Cardiovascular System:

- Heart pumps blood efficiently through systemic and pulmonary circuits.
- Regulation of blood pressure and tissue perfusion is achieved via neural and hormonal feedback mechanisms.

2. Respiratory System:

- Gas exchange occurs in alveoli, with oxygen transported to tissues and carbon dioxide removed.
- Ventilation is regulated by chemoreceptors sensitive to CO₂ and O₂ levels.

3. Nervous System:

- Central and peripheral nervous systems coordinate sensory input, motor output, and autonomic functions.

- Neurotransmitters transmit signals, ensuring rapid communication between tissues.

4. Endocrine System:

- Hormones regulate metabolism, growth, reproduction, and stress responses.
- Feedback loops maintain hormonal balance and physiological stability.

Pathological Physiology

1. Cardiovascular Disorders:

- Hypertension, heart failure, and ischemic heart disease alter normal hemodynamics.
- Pathological changes in myocardial tissue and blood vessels disrupt oxygen delivery.

2. Respiratory Disorders:

- Chronic obstructive pulmonary disease (COPD), asthma, and pneumonia impair gas exchange.

- Alterations in alveolar structure or airway obstruction lead to hypoxia and hypercapnia.
- 3. **Nervous System Disorders:**
 - Stroke, neurodegenerative diseases, and neuropathies impair neural transmission.
 - Pathophysiological changes affect cognition, motor control, and autonomic regulation.

Conclusion

Normal and pathological physiology forms the foundation of medical practice. By understanding how physiological systems operate and how diseases disrupt these functions, healthcare professionals can provide accurate diagnosis, effective treatment, and preventive care. Advances in diagnostics and molecular medicine enhance our understanding of pathophysiology and improve clinical outcomes.

References:

1. Guyton, A. C., & Hall, J. E. Textbook of Medical Physiology. Elsevier, 2021.
2. Vander, A., Sherman, J., & Luciano, D. Human Physiology: The Mechanisms of Body Function. McGraw-Hill Education, 2019.
3. McPhee, S. J., & Hammer, G. D. Pathophysiology of Disease: An Introduction to Clinical Medicine. McGraw-Hill Education, 2018.
4. Koepfen, B. M., & Stanton, B. A. Berne & Levy Physiology. Elsevier, 2018.
5. Hall, J. E. Guyton and Hall Physiology Review. Elsevier, 2020.

© Annayeva O., 2026

Тошиева Гульнабат Аллабердыевна,
ассистент кафедры Патологической анатомии.
Яйлымова Джахан Гельдимырадовна,
студент педиатрического факультета
Государственный медицинский университет Туркменистана имени Мырата Гаррыева
Ашхабад, Туркменистан

НОРМОПЛАСТИЧЕСКИЕ И ГИПЕРПЛАСТИЧЕСКИЕ ИЗМЕНЕНИЯ ШЕЙКИ МАТКИ

Аннотация

Патологические процессы шейки матки включают доброкачественные (фоновые), предраковые (дисплазии) и злокачественные состояния. Нормопластические и гиперпластические изменения относятся к доброкачественным процессам, характеризуются сохранением нормальной клеточной структуры и отсутствием атипии, но сопровождаются нарушением соотношения тканевых компонентов или избыточным разрастанием. Статья рассматривает морфологические особенности этих изменений, их этиологию и клиническое значение для ранней диагностики и профилактики предраковых процессов.

Ключевые слова:

шейка матки, нормоплазия, гиперплазия, метаплазия, эктопия,
лейкоплакия, эндоцервикальный полип.

Введение

Патология шейки матки является одной из актуальных проблем гинекологии и патологической

анатомии. Доброкачественные изменения — нормопластические и гиперпластические — не представляют непосредственной угрозы для жизни, однако могут свидетельствовать о нарушении гормонального гомеостаза или хроническом воспалении. Особое значение имеет зона трансформации — стык многослойного плоского эпителия экзоцервикса и цилиндрического эпителия эндоцервикса, где чаще всего возникают данные изменения.

Цель исследования: анализ морфологических особенностей нормопластических и гиперпластических изменений шейки матки, их этиология и клиническое значение.

Материалы и методы

Исследование основано на анализе биоптатов шейки матки, полученных у женщин с диагностированными доброкачественными изменениями. Использовались следующие методы:

- макроскопическая оценка слизистой оболочки;
- гистологическое исследование с окраской гематоксилин-эозином;
- оценка клеточной структуры, метаплазии и признаков воспаления;
- анализ сосудистой сети и стромальных компонентов.

Результаты

1. Нормопластические изменения

1.1 Эктопия шейки матки (Псевдоэрозия)

- Смещение цилиндрического эпителия из цервикального канала на влагалищную часть шейки.
- Этиология: дисгормональные состояния, травмы (родовые, аборты), воспалительные процессы; врожденная форма встречается у молодых нерожавших женщин.

- Макроскопически: участок ярко-красного цвета с бархатистой поверхностью, четко ограниченный от бледно-розовой слизистой.

- Микроскопически: однорядный цилиндрический эпителий, формирование «железистых полей», воспалительная инфильтрация стромы.

1.2 Плоскоклеточная метаплазия (Эпидермизация)

- Замещение цилиндрического эпителия многослойным плоским; физиологический механизм заживления эктопии.

- Микроскопически:

- неполная (незрелая) метаплазия — пласты полиморфных клеток под цилиндрическим эпителием;

- полная (зрелая) метаплазия — зрелый многослойный плоский эпителий покрывает всю эктопию.

- Наботовы кисты: формируются при перекрытии выводных протоков желез.

1.3 Лейкоплакия (Простая, без атипии)

- Патологическое ороговение многослойного плоского эпителия.

- Макроскопически: белые пятна или бляшки, не снимаются тампоном.

- Микроскопически: гиперкератоз, паракератоз, акантоз. Клеточная атипия отсутствует.

Заключение

Нормопластические и гиперпластические изменения шейки матки являются доброкачественными состояниями, однако отражают нарушения гормонального гомеостаза или хроническое воспаление. Длительное существование этих процессов, особенно зон незавершенной метаплазии, создает фон для развития диспластических изменений при инфицировании ВПЧ высокого онкогенного риска. Основой диагностики является гистологическое исследование биоптата для исключения клеточной атипии и инвазивного роста.

Список использованной литературы:

1. Акушерство: национальное руководство / под ред. Э.К. Айламазяна. — М.: ГЭОТАР-Медиа, 2022.
2. Серов В.Н., Сухих Г.Т. Невынашивание беременности. — М.: МИА, 2019.
3. Гусарова Т.А., Низяева Н.В. Морфологические и молекулярные особенности децидуальных клеток эндометрия при невынашивании беременности // Морфология. — 2023.

©Тошиева Г., Яйлымова Дж., 2026

Тошиева Гульнабат Аллабердыевна,
ассистент кафедры Патологической анатомии.
Гельдиева Джахансолтан Реджепмухаммедовна,
студент педиатрического факультета
Государственный медицинский университет Туркменистана имени Мырата Гаррыева
Ашхабад, Туркменистан

ПНЕВМОПАТИИ И РЕСПИРАТОРНЫЙ ДИСТРЕСС-СИНДРОМ У НОВОРОЖДЕННЫХ**Аннотация**

Пневмопатии и респираторный дистресс-синдром (РДС) являются одними из основных причин асфиксии у новорожденных. Пневмопатии включают различные формы повреждения легких, такие как гиалиновые мембраны, отечно-геморрагический синдром, ателектазы легких, синдром Вильсона-Микити. В статье рассматриваются основные виды пневмопатий, их патогенез, патоморфология, классификация и диагностика. Особое внимание уделяется причинам, механизму развития, а также ключевым патоморфологическим изменениям при этих заболеваниях.

Ключевые слова:

пневмопатии, респираторный дистресс-синдром, ателектаз, гиалиновые мембраны, отечно-геморрагический синдром, синдром Вильсона-Микити, новорожденные.

Введение

Пневмопатии и респираторный дистресс-синдром (РДС) у новорожденных являются важной медицинской проблемой, так как они занимают одно из ведущих мест среди причин асфиксии и смертности в неонатальном периоде. Респираторный дистресс-синдром часто развивается на фоне различных патогенных процессов в легких, включая ателектазы, дефицит сурфактанта, воспаление и другие нарушения. Понимание патогенеза этих заболеваний имеет ключевое значение для разработки методов их диагностики и лечения.

Цель исследования: анализ основных пневмопатий и респираторного дистресс-синдрома у новорожденных, их классификация, патогенез и патоморфологические особенности.

Материалы и методы

В исследовании использовались данные клинической диагностики и морфологического анализа тканей легких новорожденных с диагнозом пневмопатия и респираторный дистресс-синдром. Были использованы следующие методы:

- Гистологическое исследование образцов легочной ткани.
- Оценка степени повреждения альвеол и сосудов.
- Морфологическая классификация ателектазов, гиалиновых мембран и других пневмопатий.
- Электронная микроскопия для изучения сурфактанта и клеточных структур.

Результаты

1. Ателектаз легких у новорожденных

Ателектаз легких представляет собой нерасправление или спадение альвеол, что может происходить в первые два дня жизни. Это связано с особенностями дыхательных путей и несовершенством центральной регуляции дыхания у новорожденных.

Классификация ателектазов:

1. Первичные ателектазы:

- Возникают у недоношенных детей и при первичной недостаточности сурфактанта.
- Очаговые ателектазы встречаются при неполном расправлении легких.

2. Вторичные ателектазы:

- Развиваются после периода нормального дыхания.
- Возникают при механической обструкции, например, при аспирации околоплодных вод.

Патоморфология:

- Легкие выглядят уменьшенными, мясистыми, с темно-красным или синюшным цветом.
- Альвеолы имеют узкие щели или полностью спавшиеся структуры.
- Присутствуют отечная жидкость и гиалиновые мембраны.

2. Пневмопатия гиалиновых мембран (ГМ)

Гиалиновые мембраны являются основным патоморфологическим признаком РДС у новорожденных. Недоношенность и дефицит сурфактанта являются главными факторами развития этой патологии.

Заключение

Пневмопатии у новорожденных представляют собой широкий спектр заболеваний, основным механизмом которых является морфофункциональная незрелость легких. Главные патоморфологические изменения включают дефицит сурфактанта, сосудистые нарушения и воспаление. Раннее распознавание этих состояний и своевременная терапевтическая поддержка имеют важное значение для улучшения прогноза новорожденных с РДС и пневмопатиями.

Список использованной литературы:

1. Хакимов С.Х. Пневмопатии и респираторный дистресс-синдром у новорожденных. — Ташкент, 2018.
2. Гущина В.А. Респираторный дистресс-синдром у новорожденных. — М.: МИА, 2020.
3. Гельман И.Ю. Пневмопатии у новорожденных: диагностика и лечение. — СПб.: ВМЕД, 2021.

©Тошиева Г., Гельдиева Дж., 2026

Халмедов Базар Сейитмаммедович,
кандидат медицинских наук, заведующий кафедрой патологической анатомии
Сылапова Дженнет Мухамметсейидовна,
студент педиатрического факультета
Государственный медицинский университет Туркменистана имени Мырата Гаррыева
Ашхабад, Туркменистан

МОРФОФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ ДЕЦИДУАЛЬНОЙ ТКАНИ ПРИ НЕРАЗВИВАЮЩЕЙСЯ БЕРЕМЕННОСТИ

Аннотация

Неразвивающаяся беременность представляет собой патологическое состояние, при котором

прекращается развитие эмбриона или плода на ранних стадиях беременности. Морфофункциональные изменения децидуальной ткани играют ключевую роль в патогенезе данного состояния. В статье рассматриваются структурные и функциональные особенности децидуальной ткани при замершей беременности, причины изменений, а также возможные последствия для маточно-плацентарной системы. Полученные данные имеют значение для ранней диагностики и профилактики невынашивания беременности.

Ключевые слова:

децидуальная ткань, неразвивающаяся беременность, морфология, некроз, сосудистые изменения, фиброз, иммунологическая дисфункция.

Введение

Неразвивающаяся беременность (замершая беременность) — это состояние, при котором прекращается развитие эмбриона или плода на ранних сроках. Одним из определяющих факторов является состояние децидуальной ткани — специализированной ткани эндометрия, формирующейся в ответ на имплантацию эмбриона. В норме децидуальная ткань обеспечивает питание плода, участвует в иммунологической толерантности и поддерживает беременность. Изменения в морфологии и функции децидуальной ткани могут служить ранними маркерами патологии и предсказывать риск невынашивания.

Цель исследования: анализ морфологических и функциональных изменений децидуальной ткани при неразвивающейся беременности, определение их причин и последствий.

Материалы и методы

В исследовании использовались данные морфологического анализа децидуальной ткани, полученные при гистологическом и иммуногистохимическом исследовании образцов тканей у женщин с диагностированной замершей беременностью. Оценивались:

- клеточный состав децидуальной ткани;
- наличие некроза и инфильтрации лейкоцитами;
- изменения сосудистой сети;
- признаки фиброза и склероза.

Методы включали световую микроскопию, окраску гематоксилин-эозином, специальные методы выявления коллагена и иммунные маркеры воспаления.

Результаты

Морфологические изменения

Изменения в клеточном составе:

• Гиперплазия клеток: увеличение числа децидуальных клеток, связанное с воспалением и утолщением ткани.

• Нарушение дифференцировки клеток: вакуолизация и потеря характерной морфологии децидуальных клеток, что отражает нарушение их функции.

Некроз и инфильтрация лейкоцитами:

• Некротические зоны развиваются из-за гипоксии и нарушений кровоснабжения.
• Инфильтрация нейтрофилами и макрофагами усиливает воспаление и способствует дальнейшему повреждению тканей.

Изменения в сосудистой сети:

- Увеличение проницаемости сосудов, застой крови, снижение плотности капилляров.
- Возможное тромбообразование в сосудах децидуальной ткани.

Фиброз и склероз:

Неразвивающаяся беременность сопровождается комплексом взаимосвязанных морфологических и функциональных изменений децидуальной ткани. Дефекты децидуализации, воспалительные и сосудистые нарушения, гормональная и иммунная дисфункция формируют патогенетическую основу остановки развития эмбриона. Изучение морфофункциональных особенностей децидуальной ткани имеет большое значение для ранней диагностики и профилактики невынашивания беременности, а также для разработки индивидуализированных терапевтических стратегий.

Список использованной литературы:

1. Акушерство: национальное руководство / под ред. Э.К. Айламазяна. — М.: ГЭОТАР-Медиа, 2022.
2. Серов В.Н., Сухих Г.Т. Невынашивание беременности. — М.: МИА, 2019.
3. Гусарова Т.А., Низяева Н.В. Морфологические и молекулярные особенности децидуальных клеток эндометрия при невынашивании беременности // Морфология. — 2023.

©Халмедов Б., Сылапова Дж., 2026



ИСКУССТВОВЕДЕНИЕ

Shageldiyeva Mahriban,

Student

Turkmen National Institute of World Languages named after Dovletmamet Azadi.

Ashgabat, Turkmenistan

NOWRUZ: CELEBRATING SPRING AND CULTURAL HERITAGE

Abstract

This article explores the cultural, social, and historical significance of Nowruz, one of the oldest celebrations of spring observed across Central Asia. Nowruz symbolizes the renewal of nature, the beginning of a new agricultural cycle, and the promotion of peace, friendship, and harmony among communities. The article examines the traditions, rituals, and social roles of Nowruz and emphasizes its importance in preserving national identity and cultural heritage.

Keywords:

Nowruz, spring festival, cultural heritage, traditions, Central Asia, renewal, national identity.

Introduction

Nowruz, the Persian New Year, is celebrated on the vernal equinox, marking the first day of spring. This festival has been observed for thousands of years by various peoples of Central Asia, the Middle East, and beyond. In Turkmenistan, Nowruz holds a special place, symbolizing not only the start of spring but also the renewal of life, agriculture, and social bonds.

Historically, Nowruz has been a time for families to gather, perform traditional rituals, and celebrate the harmony of human life with nature. In rural areas, it coincides with the beginning of the agricultural season, while in urban areas, it is celebrated with cultural events, music, and communal activities.

Cultural Significance

Nowruz reflects a rich tapestry of traditions:

- **Family gatherings and hospitality:** Families prepare special dishes, invite relatives and friends, and exchange wishes for health and prosperity.
- **Symbolic rituals:** Lighting fires, planting trees, and arranging traditional items symbolize purification, growth, and new beginnings.
- **Music, dance, and poetry:** Folk songs, dances, and poetry enhance the festive atmosphere and transmit cultural values to younger generations.

The festival strengthens social cohesion and fosters a sense of national identity. By celebrating Nowruz, communities preserve historical practices and maintain continuity between past and present generations.

Agricultural and Seasonal Importance

For farmers, Nowruz marks the start of the planting season. Traditional rituals often include blessings for fertile soil, bountiful crops, and healthy livestock. Horses, an important symbol of Turkmen culture, are celebrated for their strength and beauty during Nowruz festivities. The connection between agriculture and seasonal cycles highlights the deep integration of human life with nature.

Modern Relevance

In contemporary society, Nowruz continues to promote national cohesion and cultural preservation. Governments, cultural institutions, and communities organize events that showcase traditional music, dance, crafts, and sports. Schools and universities engage students in educational programs about Nowruz, ensuring that the values and history of the festival are passed to new generations.

Nowruz also fosters intercultural dialogue, as it is celebrated in multiple countries and by diverse ethnic

groups. The festival encourages respect for cultural diversity while maintaining a strong sense of local and national identity.

Conclusion

Nowruz is more than a spring festival; it is a symbol of renewal, cultural heritage, and social harmony. Its celebration strengthens family bonds, promotes agricultural and seasonal awareness, and preserves traditional practices. By honoring Nowruz, communities reinforce their national identity and pass cultural values to future generations.

References:

1. Annamukhamedov, A. Traditions and Culture of the Turkmen People. Ashgabat, 2016.
2. Niyazov, K. History and Traditions of Nowruz. Ashgabat, 2018.
3. Babaev, O. Cultural Heritage of Central Asian Peoples. Moscow: Nauka, 2017.
4. UNESCO. Navruz – Intangible Cultural Heritage of Humanity. Paris, 2019.
5. Rakhmanov, B. Festivals of the East and Their Cultural Significance. Moscow, 2018.

©Shageldiyeva M., 2026

Головкин Константин,

Руководитель отдела молекулярной генетики
Научно-производственного центра коневодства государственного объединения
“Туркмен атлары”

Сапаров Омар, студент

Туркменский сельскохозяйственный университет имени С.А.Ниязова

Гурбанназарова Акмарал, студент

Туркменский государственный институт культуры
Ашхабад, Туркменистан

ПРАЗДНИК НОВРУЗ КАК СИМВОЛ ОБНОВЛЕНИЯ И НАЦИОНАЛЬНЫХ ТРАДИЦИЙ

Аннотация

В статье рассматривается значение праздника Новруз как одного из древнейших праздников народов Востока. Новруз символизирует обновление природы, начало весны и нового жизненного цикла. В работе анализируется культурное и социальное значение праздника, его традиции и обычаи, а также роль Новруза в укреплении национальных ценностей, дружбы и согласия между людьми.

Ключевые слова:

Новруз, весенний праздник, традиции, культура, обновление природы, национальные ценности.

Праздник Новруз является одним из самых древних и значимых праздников народов Востока. Он символизирует приход весны, пробуждение природы и начало нового жизненного цикла. На протяжении многих веков этот праздник объединяет людей, напоминая им о важности мира, доброты и взаимного уважения.

В Туркменистане Новруз отмечается особенно широко и торжественно. С приходом весны оживает природа, зеленеют поля и пастбища, начинается новый сельскохозяйственный сезон. Для земледельцев этот период имеет особое значение, так как именно весной закладывается основа

будущего урожая. Люди готовят национальные блюда, проводят народные гуляния, устраивают спортивные состязания и культурные мероприятия.

Новруз также является праздником дружбы и единства. В этот день люди навещают родственников и друзей, поздравляют друг друга, желают благополучия и здоровья. Особое место занимают народные традиции, песни и стихи, которые передают атмосферу весеннего обновления и радости.

Одним из таких поэтических произведений является стихотворение, посвящённое празднику Новруз.

**Мы встречаем приход весны,
Древний праздник Новруз-байрамы...**

Радуюсь приходу весны,
Мы встречаем Новруз-байрамы!
У дайхан же полно забот —
Начался земледельческий год!
И несётся по полю скакун,
Украшая собой весь табун!
Грациозность в движениях его —
Ведь искусное ремесло!
А его золотые бока
Гордо держат в седле седока!
Пусть влюбленность весной посетит,
Принесет больше радости в жизни,
На благие дела вдохновит,
И поможет служению Отчизне!
И весна наступила для нас,
Мы весной этой восхищены!
Приближается к нам каждый час,
Светлый праздник — Новруз-байрамы!

Новруз объединяет в себе глубокий символизм. Он отражает гармонию человека с природой, уважение к труду и стремление к добру. Особое значение праздник имеет и для туркменской культуры, где большое внимание уделяется традициям земледелия, коневодства и народных ремёсел.

В дни празднования Новруза проводятся различные культурные и спортивные мероприятия, демонстрирующие богатство национальной культуры. Особое внимание уделяется туркменским ахалтекинским скакунам, которые являются символом красоты, силы и благородства туркменского народа.

Таким образом, праздник Новруз играет важную роль в сохранении культурного наследия и национальных традиций. Он объединяет людей, наполняет их сердца радостью и надеждой, вдохновляет на добрые дела и укрепляет духовные ценности общества.

Список использованной литературы:

1. Аннамухаммедов А. Традиции и культура туркменского народа. – Ашхабад: Ылым, 2016.
2. Ниязов К. История и традиции праздника Новруз. – Ашхабад, 2018.
3. Бабаев О. Культурное наследие народов Центральной Азии. – Москва: Наука, 2017.
4. UNESCO. Navruz – Intangible Cultural Heritage of Humanity. – Paris, 2019.
5. Рахманов Б. Народные праздники Востока и их культурное значение. – Москва, 2018.

©Головкин К., Сапаров О., Гурбанназарова А., 2026