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Section 1. Geology

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DYNAMICS OF GEOCHEMICAL ANOMALIES IN GROUNDWATER BEFORE EARTHQUAKES

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Abstract

This study investigates hydrogeochemical anomalies in groundwater as potential precursors to seismic events in Azerbaijan. Long-term monitoring in the Shamakhi region, including data from the Baku (2000) and Shamakhi (2019) earthquakes, reveals consistent pre-seismic variations in sulfate, hydrogencarbonate, carbonate, and alkali metal ions (Na, K), along with shifts in redox potential and helium emissions. These anomalies typically emerged 1–16 days before earthquakes and were recorded at multiple stations. The findings support hydrogeochemical analysis as a valuable complement to traditional seismic forecasting and highlight the need for expanded monitoring networks to enhance spatial resolution and early warning systems. This work contributes to integrated seismic hazard assessment by combining geophysical, geochemical, and remote sensing methods.

Keywords: *Hydrogeochemical monitoring, geochemical anomalies, earthquake precursors, groundwater, seismic forecasting*

Introduction

Understanding earthquake precursors is essential for seismic hazard mitigation. Among various methods, groundwater geochemistry has shown promise for detecting pre-seismic changes. Previous studies have documented anomalies in ion concentrations, redox potential, and dissolved gases (e.g., helium) prior to seismic events, though the mechanisms linking these changes to tectonic stress remain debated (Ingebritsen et al., 2006).

The successful prediction of the 1975 Haicheng earthquake (M7.3), partly based on hydrological anomalies, contrasts sharply with the failure to forecast the 1976 Tangshan earthquake (M7.8), which caused over 240,000 fatalities despite similar signs (Wang et al., 2006). These contrasting outcomes underscore the challenges of reliable earthquake forecasting.

This study addresses such challenges through systematic hydrogeochemical monitoring in Azerbaijan, a tectonically active region at the Eurasian-Arabian plate boundary. Despite some progress in automated monitoring elsewhere (Japan, U.S., China, Turkey, Iceland), most geochemical data in Azerbaijan come from manual sampling (Roeloffs, 1988; Kissin & Grinevsky, 1990; Matsumoto & Koizumi, 2011). Given Azerbaijan's active fault zones and rich hydrothermal resources, the region offers a valuable natural laboratory.

The primary objectives are to identify pre-seismic hydrogeochemical anomalies, correlate them with seismic activity, and establish a framework for geochemical monitoring to support seismic hazard assessment.

Methods

From 2015 to 2023, groundwater samples were collected monthly – and more frequently during seismic swarms – from wells and thermal springs in the Shamakhi region. Major ions (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, SO_4^{2-}, HCO_3^{-}) were analyzed via ion chromatography (Dionex ICS-6000). Oxidation-reduction potential (ORP) was measured in situ with a YSI Professional Plus multiparameter probe. Dissolved helium was analyzed using the INGEM-1 gas analyzer (detection limit: 0.1 ppm).

Cross-correlation functions identified pre-seismic anomalies. Principal Component Analysis (PCA) was used to filter background noise. Machine learning models (Random Forest, SVM) enhanced anomaly detection and forecasting. While this integrative approach improves understanding of groundwater behavior before earthquakes, seasonal changes, contamination, and dilution effects remain confounding factors. Sampling resolution may also limit detection of short-term precursors. Future efforts should prioritize real-time monitoring.

Hydrogeochemical Indicators for Seismic Monitoring

Long-term hydrogeochemical monitoring in Azerbaijan's seismogenic zones has involved observing variations in groundwater, mud volcanic waters, free and dissolved gases (e.g., Rn, He), and radioactive emissions (Keramova, 2004; Telesca et al., 2020). Key indicators include:

- **Ion concentrations:** pH, Eh, ∑(Cl^{-}, Br^{-}, I^{-}), HCO_3^{-}, CO_3^{2-}, SO_4^{2-}, Na^{+}, K^{+}, Ca^{2+}, Mg^{2+}, mineralization, Fe^{2+}/Fe^{3+};
- **Hydrogeodynamics:** Continuous measurements of groundwater level and flow rates in observation wells.

Real-time automated systems track daily variations and intensify during seismic activity or aftershocks.

Hydrogeochemical Characteristics of Seismic Observation Wells

The Shamakhi region is Azerbaijan's most active seismic zone. Notable wells include:

- **Shamakhi No. 8**
  - Kurlov formula: Cl_{43} SO_{440} HCO_{317};
  - Temp: 8–11 °C | pH: 6.9 | Eh: –10 mV | Mineralization: 1.2 g/L;
  - Cold, moderately mineralized chloride-bicarbonate sodium-type water in slightly acidic, weakly reducing environments.
- **Chukhuryurd No. 49**
  - Kurlov formula: HCO_{348} SO_{436} Cl_{16};
  - Temp: 18–21 °C | pH: 6.8 | Eh: –80 mV;
  - Subthermal, slightly mineralized water with dissolved H_2S under moderately reducing conditions.
- **Damirchi Mud Volcano**
  - pH: 6.2 | Eh: +25 mV;
  - Surface gryphon gases indicate atmospheric interaction.

Seismic Event Case Studies

- **Baku Earthquake (Nov 25, 2000; M6.8; depth 13 km)**

Anomalies in Shamakhi No. 8 began Nov 19.

Groundwater level drop, increased Ca^{2+}, Mg^{2+}, Fe^{2+}/Fe^{3+}; decreased Na^{+}, K^{+}, Cl^{-}, Br^{-}, I^{-}.

SO_4^{2-} rose from 440–480 mg/L to 640 mg/L, then dropped to 20 mg/L.

Eh dropped in Chukhuryurd No. 49; pH fell to 7.0.

- **Shamakhi Earthquake (Feb 5, 2019; M5.3; depth 8 km)**

Preceded by sharp water level drop and discoloration.

SO_4^{2-} peaked at 640 mg/L, then declined.

Na^+/K^+ dropped to 450 mg/L; Fe levels spiked to 48 mg/L.

CO_3^{2-} peaked at 220 mg/L.

Helium as a Seismic Indicator

Helium anomalies were strong and consistent. Before the 2019 quake, helium levels increased tenfold near the epicenter and spread to other sites. Levels rose from 0 to 100% in deep events; prior to the 2000 quake, from 1% to 3–4%. These patterns suggest helium as a robust precursor.

Correlation Between Anomalies and Seismicity

Precursor strength increased with earthquake magnitude and decreased with distance. Key correlations:

- **Helium:** $r = 0.82$ ($p < 0.01$), peaking 10–20 days before earthquakes;
- **Ca^{2+} and Mg^{2+}:** $r = 0.65–0.72$ ($p < 0.05$);
- **Eh anomalies:** Appeared ~1 month prior to events.

SO_4^{2-} anomalies were particularly reliable, occurring across multiple stations. However, sparse monitoring limits spatial analysis.

Practical Implications for Forecasting

Integrating hydrogeochemical data with seismic monitoring can enhance early warning systems. For instance, quasi-annual seismicity near the Mingechevir reservoir may be influenced by water-level changes, though data remain preliminary (Telesca et al., 2020).

Future recommendations:

- Expand real-time monitoring across fault zones;
- Integrate hydrogeochemical data with GPS strain and microseismicity;
- Apply machine learning to improve anomaly detection and forecasting.

These steps could substantially improve predictive accuracy in Azerbaijan and other tectonically active regions.

Conclusion

Hydrogeochemical monitoring – particularly ion fluctuations, redox shifts, and helium emissions – shows strong potential for earthquake forecasting in Azerbaijan. Consistent pre-seismic patterns support their value as geochemical precursors. However, environmental noise and predictive limitations remain challenges.

For robust seismic hazard mitigation, future research should prioritize high-resolution, real-time hydrogeochemical data, integrate geophysical measurements, and apply machine learning for anomaly validation. Such a multidisciplinary framework may significantly advance regional early warning systems.

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Section 2. Philology and linguistics

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FACTORS DETERMINING THE EVOLUTION OF LITERARY GENRES

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Abstract

There are a number of factors that indicate the change of genres in prose. The most important of these is the change of the rhythm of time, the formation of a new socio-moral environment. The change of the ideological atmosphere also influenced the development of Azerbaijani prose.

Keywords: *genre, factors, evolution, magic realism, Azerbaijani literature, aesthetics, poetics*

Main part

If we compare novels written from the early twentieth century to the present day and prose works in general in terms of genre dynamics, very interesting nuances can be revealed. In this regard, the question of which prose genre an author chose at a particular time is an interesting one. It is clear that many people can read short stories and novellas, both due to their brevity in volume and the desire to quickly review objects in the "kaleidoscope of time". Unlike the short story, the novel is not intended for a wide readership. There are quiet and controversial, that is, noisy, readings of the novel. Once upon a time, in the 80s and 90s of the XX century, two novels by Movlud Suleymanli were published: "The Mill" and "Migration".

These works are very different in terms of genre functionality and social problems. The novel "The Mill" depicts the fate of the Soviet era, the ideology that weighed heavily on people's souls and was hostile to humanity. In the novel "Migration", the genre functionality and stylistic palette comes from a different direction. While the first novel focuses more on social problems, the second focuses on the things that mold and shape the soul of an Azerbaijani from childhood to old age. Over time, this second direction became prominent and dominant in Mevlud Suleymanli's novels.

The work "The Nobility of Yel Ahmed" traces the secrets of the world of folklore and the paradoxes of myth that shaped the Azerbaijani nation. The secrets of the soul, embodied in poetic texts since the time of the Hurufi poet Imaddadin Nasimi, wander in a story "invented" by the author in his native language. The work "The Mill" caused wide resonance and controversy immediately after its publication. Later writers of the Soviet era

criticized the "pompous atmosphere" of the novel, stating that such a reality is extreme fiction. Some members of that generation praised the work. It is well known that the mill is a symbol of abundance. If this vessel of abundance is broken, the water in it dries up, and the mill becomes a place of pleasure and fun, abundance will eventually depart from man. Immediately after the publication of The Mill, all conservative authors mobilized, which meant the end of Soviet-era aesthetics. Mevlud never again wrote works with such pathos. When "Migration" was published, readers praised it as a work worthy of Marquez's pen. There was even a saying that "Migration" was a novel written under the influence of Márquez. Probably, at that time, works of this type also appeared in the literature of other peoples, that is, sometimes the energy of a great literary tradition is inevitable. If you pay attention, that tradition, that is, the «Marquezian influence», manifested itself in the literature of most Turkic peoples. But that was not the point. The author claimed that at the time of writing he was not familiar with Marquez's texts. Time can to some extent dictate what genre a writer chooses. In the nineties of the last century, saying goodbye to the old aesthetics simultaneously required laying the foundations of new poetic systems. This conditioned its integration into world literature. Starting from this period, the style of magic realism entered our prose experience. First, about magic realism. Although this style appeared in the early 20th century, it gained special popularity in the middle of the 20th century. Marquez's novel "One Hundred Years of Solitude" is a great experiment for the art of the novel as a whole. What is the main point of magic realism? In a fabricated text, the author deliberately replaces real events with a utopian reality. One of the studies on this subject states: "In fact, magical realism is a closer relative to literary fiction than fantasy – which helps in identifying it in the books we read. Series like The Lord of the Rings, The Kingkiller Chronicle, and even Percy Jackson, are fantasy fiction for myriad reasons, but a simple way to differentiate fantasy from magical realism comes from Gotham writers: "This enchantment of Latin American marvelous reality originates "from an unexpected alteration of reality (the miracle), from a privileged revelation of reality, an unaccustomed insight that is singularly favored by the unexpected richness of reality or an amplification of the scale and categories of reality [...]" (CARPENTIER, 1995, p. 85–86). Carpentier's explanation denotes a relationship between reality and observer imbu with both modifying and mimetic operations by describing the ideas of alteration/amplification and revelation/insight (CHIAMPI, 2015, p. 33). It follows that his concept simultaneously considers magic a product of human perception and a component of reality (CHIAMPI, 2015, p. 33–34)." (Bruno Amaral Dariva, 201).

In another study we read: "I was reminded of the short story "Two Words" by the Chilean writer Isabel Allende, whose novel The Japanese Lover was recently published. In general, this writer is one of the strongest prose writers who makes people, especially women, read with the plot of her prose texts. Before we talk about the story, let's pay attention to one moment in her interview. The question is asked, "Is love really the driving force of your life?" Isabel Allende's answer is, "Love is really the driving force of the whole world." It is a question that still intrigues us today, even though we exploit it mercilessly. My books have been translated into many languages, and readers in any language understand the love I speak of because the sentiment is universal. But consciousness is not always so. That doesn't mean I'm a completely irrational person. Sometimes I have to think..." (Yusifli C., 2012, 19).

The researcher continues: "We want to pay attention to the technologies of plot construction in prose. Experience shows that sometimes a very interesting story changes, shrinks, loses its meaning under the writer's pen, or rather, the constructed plot line either shrinks, eliminates the meaning of the story, or changes it and is used to reveal the essence of the amazing events of a great epoch. The story, undoubtedly, must change throughout the plot, so to speak, melt, until it is woven into the fabric and cells of the work, until it is transformed, then in time (that is, throughout the plot time) it will become no more interesting than an advertising poster. The hero of the story "Two Words" is in the business of selling words, trading in words.

We wrote about this story in another coincidence. A woman sets up a tent in the big cities of the world and waits for customers. The words she offers are not ordinary, they are magical, these words bring light into people's hearts, make them taste the taste of happiness. But everyone gets his share – neither more nor less.... The one who takes these magic words home is also deceived, because the light and the aura of happiness also involve lies and deceit, and the soul is in one heart. "These lies are made to keep people from the tragedies and terrible hardships of life" (Yusifli C., 2012, 67).

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Section 3. Medicine

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IMPACT OF LOW ENERGY AVAILABILITY ON HORMONAL PROFILES AND ATHLETIC PERFORMANCE

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Abstract

Background: Low energy availability in athletes impacts hormonal regulation, especially in females. Insufficient caloric intake affects the hypothalamic-pituitary-gonadal axis, causing decreased pulsatile release of hormones and a reduction in estradiol production, leading to functional hypothalamic amenorrhea.

Aim of study: This study aims to explore the specific impacts of low energy availability on hormonal profiles and athletic performance, focusing on the relationship between estradiol levels and performance outcomes in female athletes.

Methods: A literature review examined the impact of LEA on hormonal profiles and athletic performance, focusing on Albanian female athletes and cultural and nutritional factors.

Results: The findings indicate that lower estradiol levels negatively impact mitochondrial function, leading to decreased endurance performance and prolonged recovery periods. Chronic energy shortages increase cortisol levels, impacting menstrual cycles and increasing musculoskeletal injuries. Monitoring hormonal profiles is crucial for early detection and prevention.

Discussion: The study highlights the significant impact of Leukemia-associated autoimmune disease (LEA) on hormonal profiles and athletic performance in female athletes, emphasizing the importance of estradiol balance for optimal health outcomes.

Conclusion: Estradiol regulates body composition, energy use, and performance in female athletes, especially under low energy availability. Addressing sociocultural factors requires culturally appropriate methods, psychological support, and nutritional education. Future initiatives should integrate multidisciplinary support networks.

Keywords: *Low Energy Availability (LEA), Estradiol, Hormonal Regulation, Athletic Performance, Cortisol, Female Athletes*

Introduction

Low Energy Availability (LEA) has emerged as a central concern in sports medicine and performance physiology, particularly among female athletes. LEA occurs when dietary energy intake fails to adequately meet the combined demands of exercise and essential physiological functions (Mountjoy, M., Sundgot-Borgen, J.K., Burke, L.M., Ackerman, K.E., Blauwet, C., Constantini, N., Lebrun, C., Lundy, B., Melin, A.K., Meyer, N. L., Sherman, R.T., Tenforde, A.S., Klungland Torstveit, M., & Budgett, R., 2018). Low energy availability (LEA) arises when an athlete's caloric intake is inadequate to satisfy both the physical demands of their training and essential physiological processes. The resulting energy deficit disrupts the hypothalamic-pituitary-gonadal (HPG) axis, reducing gonadotropin-releasing hormone (GnRH) secretion and impairing estrogen production, primarily estradiol (De Souza, M.J., Nattiv, A., Joy, E., Misra, M., Williams, N.I., Mallinson, R.J., Gibbs, J.C., Olmsted, M., Goolsby, M., Matheson, G., & Expert Panel, 2014; Melin, A., Tornberg, Å.B., Skouby, S., Møller, S.S., Sundgot-Borgen, J., Faber, J., Sidelmann, J.J., Aziz, M., & Sjödin, A., 2015). Emerging research has highlighted that LEA is not only a condition of insufficient energy but also a critical stressor that disrupts multiple hormonal pathways, leading to wide-ranging physiological consequences (Mountjoy, M., Sundgot-Borgen, J.K., Burke, L.M., Ackerman, K.E., Blauwet, C., Constantini, N., Lebrun, C., Lundy, B., Melin,A.K., Meyer, N.L., Sherman, R.T., Tenforde, A.S., Klungland Torstveit, M., & Budgett, R., 2018). This imbalance in energy can significantly impact hormonal regulation, especially in female athletes, as the hypothalamic-pituitary-gonadal (HPG) axis is particularly responsive to changes in energy levels. LEA leads to a decrease in the pulsatile release of gonadotropin-releasing hormone (GnRH), which subsequently reduces the secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH). This sequence of hormonal changes results in lower estradiol production, a critical feature of functional hypothalamic amenorrhea (FHA) (Cabre, H.E., Moore, S.R., Smith-Ryan, A.E., & Hackney, A.C., 2022). Moreover, this hormonal disturbance contributes to a cascade of health problems including functional hypothalamic amenorrhea (FHA), compromised bone mineral density, and reduced athletic performance.

Recent evidence also implicates LEA in altering thyroid function (low T3) and elevating stress hormone levels, particularly cortisol (Ackerman K. E., Holtzman B., Cooper K. M., et al., 2019; Slater, J., Brown, R., McLay-Cooke, R., & Black, K., 2017). These adaptations, while potentially protective in the short term, have deleterious long-term consequences on recovery, immunity, and performance. Furthermore, female athletes in developing nations such as Albania may be at increased risk due to sociocultural pressures, insufficient sports nutrition education, and limited access to health monitoring (Caushi Alketa and Latollari, Elda and Cuka, Agron, 2022; Wasserfurth, P., Palmowski, J., Hahn, A., & Krüger, K., 2020).

While previous discussions have addressed estradiol's role in preventing Relative Energy Deficiency in Sport (RED-S), this section examines the specific ways in which LEA interferes with estradiol production. The suppression of estradiol not only impacts reproductive health but also influences other endocrine systems, including the thyroid and adrenal glands. A recent study has showed that athletes experiencing LEA often show decreased levels of triiodothyronine (T3) and increased cortisol, which can lead to compromised metabolic function and a higher risk of injuries (Castanier, C., Bougault, V., Teulier, C., Jaffré, C., Schiano-Lomoriello, S., Vibarel-Rebot, N., Villemain, A., Rieth, N., Le-Scanff, C., Buisson, C., & Collomp, K., 2021). This article aims to provide an updated, multidisciplinary view on the physiological consequences of LEA, especially its impact on estradiol and related hormonal profiles, while addressing performance outcomes in elite female athletes. Cultural context is considered vital, as body image norms and dietary restrictions can influence energy balance and endocrine health (Logue, D.M., Madigan, S.M.,

Melin, A., Delahunt, E., Heinen, M., Donnell, S.M., & Corish, C.A., 2020). This study aims to explore the specific impacts of low energy availability on hormonal profiles and athletic performance, focusing on the relationship between estradiol levels and performance outcomes in female athletes.

Methodology

This study employs a comprehensive literature review, analyzing existing research on the effects of LEA on hormonal profiles and athletic performance, particularly focusing on female athletes. In this review, over 60 articles were systematically evaluated using predefined inclusion and exclusion criteria related to female athletic populations and LEA-induced hormonal dysregulation. Key databases were consulted to identify peer-reviewed articles that explore hormonal changes associated with LEA, the physiological implications for athletic performance, and strategies for monitoring and intervention. Grey literature, including expert consensus statements and guidelines from sports federations, was also incorporated to align clinical perspectives with research evidence. Studies were evaluated based on quality criteria, including clarity of methodology, participant selection, and hormonal outcome measures. Both cross-sectional and longitudinal designs were reviewed to compare short- and long-term effects of LEA. This study is based on a narrative and integrative literature review that examined scholarly research published between 2010 and 2024 concerning the physiological, hormonal, and performance effects of low energy availability (LEA) in female athletes. Databases such as PubMed, ScienceDirect, Scopus, and Google Scholar were used to identify relevant peer-reviewed articles. Keywords included 'low energy availability', 'estradiol suppression', 'functional hypothalamic amenorrhea', 'female athlete triad', 'RED-S', and 'performance outcomes in female athletes'. Studies were selected based on empirical design quality, relevance to endurance and strength athletes, and inclusion of hormonal biomarkers such as estradiol, cortisol, T3, and LH (Melin, A., Tornberg, Å.B., Skouby, S., Møller, S.S., Sundgot-Borgen, J., Faber, J., Sidelmann, J.J., Aziz, M., & Sjödin, A., 2015). Inclusion criteria consisted of studies written in English, focused on human female athletes, and providing empirical or review-based analysis of hormonal changes in response to LEA. Research including athletes from culturally comparable populations to Albania was prioritized. Articles addressing both physiological mechanisms and applied outcomes (e.g., endurance, strength, menstruation, recovery) were included.

A subset of data concerning Albanian female athletes was drawn from national surveys, sports university records, and studies published in regional journals (Caushi Alketa and Latollari, Elda and Cuka, Agron, 2022). Additionally, reports from international sports medicine organizations were referenced to contextualize health guidelines and best practices (Mountjoy M., Sundgot-Borgen J., Burke L., et al., 2014; WADA. 2022). The review also incorporates findings specific to Albanian female athletes, considering cultural and nutritional factors.

Results

1. **Estradiol and Athletic Performance under LEA:** Lowered levels of estradiol negatively affect mitochondrial function, which is essential for energy generation during endurance activities. Research indicates that estradiol improves mitochondrial efficiency by influencing oxidative phosphorylation and decreasing the production of reactive oxygen species (ROS) (Cabre, H.E., Moore, S.R., Smith-Ryan, A.E., & Hackney, A.C., 2022). In elite Albanian athletes, where cultural dietary habits may intensify energy shortages, the reduction of estradiol can result in decreased endurance performance, lower force generation, and prolonged recovery periods. Estradiol, essential for lipid metabolism and glycogen preservation, is linked to impaired mitochondrial function in female athletes, causing decreased aerobic capacity and delayed recovery due to LEA (Ihalainen, J.K., Mikkonen, R.S., Ackerman, K.E. et al., 2024; Enns, D.L., & Tiidus, P.M., 2010).
2. **Interaction between Estradiol and Cortisol:** Increased cortisol levels, which often occur due to chronic

energy shortages, further suppress estradiol by diminishing the pulsatility of GnR H. This disruption in hormonal balance affects menstrual cycles and heightens the likelihood of musculoskeletal injuries due to bone resorption prompted by cortisol (Cabre, H. E., Moore, S. R., Smith-Ryan, A. E., & Hackney, A. C., 2022). The combined effects of estradiol and cortisol on athletic performance can lead to reduced lean body mass, a crucial factor in performance outcomes, particularly harmful for female athletes in Albania who participate in strength-oriented sports (Castanier, C., Bougault, V., Teulier, C., Jaffré, C., Schiano-Lomoriello, S., Vibarel-Rebot, N., Villemain, A., Rieth, N., Le-Scanff, C., Buisson, C., & Collomp, K., 2021). Studies show that elevated cortisol levels due to LEA further suppress GnRH and inhibit estradiol production, creating a vicious cycle of hormonal disruption (De Souza, M. J., Nattiv, A., Joy, E., Misra, M., Williams, N. I., Mallinson, R. J., Gibbs, J. C., Olmsted, M., Goolsby, M., Matheson, G., & Expert Panel, 2014; Cabre, H. E., Moore, S. R., Smith-Ryan, A. E., & Hackney, A. C., 2022). This imbalance contributes to menstrual dysfunction, decreased bone density, and increased risk of musculoskeletal injuries (Melin, A., Tornberg, Å. B., Skouby, S., Møller, S. S., Sundgot-Borgen, J., Faber, J., Sidelmann, J. J., Aziz, M., & Sjödin, A., 2015; Tenforde, A. S., Barrack, M. T., Nattiv, A., & Fredericson, M., 2016).

3. **Cardiovascular Health Implications:** Estradiol promotes vasodilation by influencing endothelial nitric oxide synthase (eNOS). Reduced endothelial function caused by low estradiol levels in LEA results in less blood flow and oxygen supply to active muscles. Increased arterial stiffness and a higher risk of cardiovascular disease have been associated with this vascular dysfunction in female athletes suffering from long-term energy deficits (Cabre, H. E., Moore, S. R., Smith-Ryan, A. E., & Hackney, A. C., 2022). Estradiol deficiency, induced by LEA, can lead to cardiovascular impairments, including arterial stiffness, increased heart rate, and reduced oxygen delivery, potentially increasing cardiovascular risk in high-performing athletes (Elliott-Sale, K. J., Minahan, C. L., de Jonge, X. A. K. J., Ackerman, K. E., Sipilä, S., Constantini, N. W., Lebrun, C. M., & Hackney, A. C., 2021). Early identification of vascular dysfunction is crucial for Albanian athletes, who may have restricted access to sophisticated medical monitoring.
4. **Longitudinal Monitoring of Hormonal Profiles:** Establishing a hormone monitoring program for Albanian female athletes may aid in spotting LEA early and averting long-term health issues. Regular measurement of estradiol, cortisol, and T3 levels can provide important information about an athlete's energy balance and overall health, aligning with the World Anti-Doping Agency's recommendations for monitoring hormonal changes (Collomp K., 2022). Hormonal monitoring, including estradiol, cortisol, and T3 levels, was found to be a reliable method to detect early signs of energy deficiency and performance degradation. Several studies recommend implementing hormonal tracking in sports programs for adolescent and elite-level athletes (Logue, D. M., Madigan, S. M., Melin, A., Delahunt, E., Heinen, M., Donnell, S. M., & Corish, C. A., 2020; WADA. 2022).
5. **Nutritional Strategies:** A multidisciplinary approach is necessary to address LEA, with nutrition playing a crucial role in reestablishing hormonal balance. An adequate diet of macronutrients – particularly fats and carbohydrates – is essential for maintaining estradiol synthesis and overall endocrine function. Incorporating traditional Albanian foods high in healthy fats can enhance energy availability and promote estradiol production. In Albanian female ath-

letes, dietary practices low in fat and carbohydrates have been associated with menstrual disturbances, early fatigue, and immune suppression (Caushi Alketa and Latollari, Elda and Cuka, Agron, (2022). Moreover, insufficient access to medical screenings and sports psychology services contributes to under diagnosis and poor intervention.

6. **Psychological and Social Factors:** The psychological and social elements contributing to energy shortages are often overlooked. Chronic calorie restriction and disordered eating patterns may arise from the rigorous training demands of professional sports and cultural pressures (Wasserfurth, P., Palmowski, J., Hahn, A., & Krüger, K., 2020). Psychological disturbances such as increased anxiety, poor body image, and reduced concentration are frequently reported among athletes with LEA, correlating with hormonal imbalances and overtraining syndrome (Slater, J., Brown, R., McLay-Cooke, R., & Black, K., 2017; Gibbs, J.C., Williams, N.I., & De Souza, M.J., 2013). These challenges can be exacerbated for Albanian female athletes due to limited access to mental health and sports nutrition specialists.

The findings indicate that lower estradiol levels negatively affect mitochondrial function, which is critical for energy generation during endurance activities. Estradiol is shown to enhance mitochondrial efficiency, and its reduction can lead to decreased endurance performance, lower force generation, and prolonged recovery periods, especially in athletes with high aerobic demands (Ihalainen, J.K., Mikkonen, R.S., Ackerman, K.E. et al., 2024). LEA, along with other factors, can lead to maladaptive changes, impairing physiological systems and affecting health, well-being, and sport performance, resulting in REDs, including neuroendocrine, bone, immune, and hematological effects (Angelidi, A.M., Stefanakis, K., Chou, S.H., Valenzuela-Vallejo, L., Dipla, K., Boutari, C., Ntoskas, K., Tokmakidis, P., Kokkinos, A., Goulis, D. G., Papadaki, H.A., & Mantzoros, C.S., 2024). There is also evidence that suppressed estradiol may impair neuromuscular coordination, thus increasing the risk of injury during high-intensity movements and competition (Gibbs, J.C., Williams, N.I., & De Souza, M.J., 2013). Additionally, increased cortisol levels due to chronic energy shortages further suppress estradiol, impacting menstrual cycles and increasing the risk of musculoskeletal injuries (Cabre, H.E., Moore, S.R., Smith-Ryan, A.E., & Hackney, A.C., 2022). The study also highlights the importance of monitoring hormonal profiles to detect LEA early and prevent long-term health issues.

Discussion

The findings underscore the significant impact of LEA on hormonal profiles and athletic performance in female athletes. Estradiol's role in maintaining energy balance, muscle mass, and cardiovascular health is critical, particularly in the context of LEA. Estradiol is also crucial for bone health, menstrual function, and hunger regulation-all of which are necessary for sustaining long-term health and athletic performance. Cumulative evidence underscores the central role of estradiol in athletic performance and long-term health outcomes. Estradiol's regulation of energy metabolism, muscle repair, bone integrity, and cardiovascular efficiency is particularly critical for female athletes operating under the chronic stress of high training loads and restricted energy availability (De Souza, M.J., Nattiv, A., Joy, E., Misra, M., Williams, N.I., Mallinson, R.J., Gibbs, J.C., Olmsted, M., Goolsby, M., Matheson, G., & Expert Panel, 2014; Ihalainen, J.K., Mikkonen, R.S., Ackerman, K.E. et al., 2024).

Recent evidence suggests that interventions targeting menstrual tracking and education among athletes and coaches may significantly reduce the incidence of RED-S (Hunter, N.N., & Smith, M.A., 2024). The chronic under diagnosis of LEA among adolescent athletes raises concerns regarding long-term hormonal programming and reproductive capacity in later life (Ackerman K.E., Holtzman B., Cooper K.M., et al., 2019). A coordinated care model that includes nutritionists, psychologists, and endocrinologists is essential to support athletes through recovery from LEA and

to prevent recurrence (Holtzman, B., & Ackerman, K.E., 2021). Implementing energy availability screening protocols during pre-season evaluations could serve as an early warning system for physiological stress and hormonal imbalance (Tenforde, A.S., Barrack, M.T., Nattiv, A., & Fredericson, M., 2016). It is now widely recognized that energy availability is a more precise marker of athlete health than body weight or BMI alone. Subclinical hormonal disruptions can occur even in athletes who appear physically fit and lean (Mountjoy, M., Sundgot-Borgen, J.K., Burke, L.M., Ackerman, K.E., Blauwet, C., Constantini, N., Lebrun, C., Lundy, B., Melin, A. K., Meyer, N.L., Sherman, R.T., Tenforde, A.S., Klungland Torstveit, M., & Budgett, R., 2018). In addition to reproductive suppression, LEA has been associated with impaired immune function and altered neuromuscular coordination, which may increase the risk of overuse injuries and illness in endurance athletes (Slater, J., Brown, R., McLay-Cooke, R., & Black, K., 2017; Gibbs, J.C., Williams, N.I., & De Souza, M.J., 2013).

However, by interfering with the hypothalamic-pituitary-gonadal (HPG) axis, LEA interferes with the synthesis of estradiol, which results in menstrual irregularities, decreased bone mineral density (BMD), and a decreased ability for endurance and recuperation.

LEA-induced endocrine disruptions extend beyond estradiol. Low T3 levels reflect thyroid suppression, whereas high cortisol indicates chronic stress – both of which are linked to decreased performance, mood instability, and increased susceptibility to illness and overtraining (Mountjoy M., Sundgot-Borgen J., Burke L., et al., 2014; Elliott-Sale, K.J., Minahan, C.L., de Jonge, X.A.K.J., Ackerman, K.E., Sipilä, S., Constantini, N.W., Lebrun, C. M., & Hackney, A. C., 2021). The hormonal instability significantly affects psychological well-being, a factor that must be addressed through athlete-centered care. Integrating multidisciplinary interventions – such as nutritional counseling, mental health support, and regular hormonal screenings – has been shown to improve both health markers and performance outcomes (Ackerman K.E., Holtzman B., Cooper K.M., et al., 2019; Logue, D.M., Madigan, S.M., Melin, A., Delahunt, E., Heinen, M., Donnell, S.M., & Corish, C.A., 2020). Digital health tools and mobile applications offer promising avenues for tracking symptoms, menstrual cycles, and performance metrics in real time (Holtzman, B., & Ackerman, K.E., 2021). Advancements in mobile health monitoring – such as wearable devices that track heart rate variability, sleep quality, and caloric expenditure – offer new opportunities for early detection and individualized LEA interventions (Hunter, N.N., & Smith, M.A., 2024). Another dimension worth addressing is the role of energy periodization and intra-cycle energy deficits, where athletes maintain adequate overall intake but fail to match energy availability during intense training periods (Logue, D.M., Madigan, S.M., Melin, A., Delahunt, E., Heinen, M., Donnell, S.M., & Corish, C.A., 2020).

From a sociocultural perspective, Albanian female athletes face challenges related to traditional beliefs on body image, gender roles, and nutrition. These factors, combined with limited institutional support, increase the risk for undiagnosed LEA and subsequent hormonal dysfunction (Caushi Alketa and Latollari, Elda and Cuka, Agron, 2022). The interaction between estradiol and cortisol highlights the importance of hormonal balance for optimal performance and health outcomes. The study emphasizes the need for targeted interventions, including nutritional strategies and psychological support, to mitigate the risks associated with LEA. Promoting education about LEA and RED-S among athletes, coaches, and families is vital to reduce stigma and foster early intervention.

Conclusion

Low energy availability represents a substantial threat to hormonal regulation, performance, and long-term health among female athletes. Estradiol suppression, coupled with elevated cortisol and reduced thyroid function, contributes to decreased endurance, injury susceptibility, mood disturbances, and impaired recovery. This study emphasizes how important estradiol is for controlling body composition, energy use, and performance in Albanian female elite athletes, especially when low energy availability (LEA) is present. By influencing mitochondrial function and β-adrenergic activity, estradiol promotes lean body mass preservation, promotes favorable

fat distribution, and increases metabolic efficiency. Multidisciplinary support – combining sports medicine, endocrinology, nutrition, and psychology – is essential to restore energy balance and hormonal health.

Addressing the sociocultural elements causing energy shortages also requires culturally appropriate methods, psychological support, and nutritional instruction. In the context of Albanian elite athletes, these risks are compounded by cultural norms, inadequate dietary intake, and limited access to medical and psychological support. Recognizing estradiol as a biomarker for physiological strain should prompt early screening and intervention programs. Individualized care and culturally aware education campaigns should be the top priorities of future programs to lower the prevalence of LEA and improve female athletes' performance and general well-being. Future initiatives ought to concentrate on incorporating multidisciplinary support networks, such as sports psychologists and nutritionists, and utilizing technology to track energy balance and performance indicators in real time. Athletes can optimize their estradiol levels, reduce the risks of LEA, and improve their competitive and overall health by giving priority to these techniques.

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THE TRANSFER OF GEORGIAN LITERATURE TO THE AZERBAIJAN LANGUAGE TRANSLATION PROBLEMS

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Abstract

The article examines the problems of translating Georgian literature. It is noted that in translating from Georgian, writers who lived and created here play an important role. In addition to translating the best examples of Georgian literature into our native language and conveying the spiritual wealth of the neighboring people to the Azerbaijani reader, it also serves to further strengthen the arches of the bridge of spiritual friendship that has existed between our peoples for centuries. This process has become more intensive in literary translation since the 1950s. The art of translation is based on practical and theoretical foundations. Everything depends on the quality of the translated text. Theoretical and practical features are expected in translations from Georgian literature.

Keywords: *Georgian literature, translation problems, Azerbaijani language, adequacy*

The writers who lived and created here play an important role. In addition to translating the best examples of Georgian literature into our native language and conveying the spiritual wealth of the neighboring people to the Azerbaijani reader, it also serves to further strengthen the arches of the bridge of spiritual friendship that has existed between our peoples for centuries. This process has become more intensive since the 1950s. The art of translation is based on practical and theoretical foundations. Everything depends on the quality of the translated text. Etimad Bashkechid evaluates the successful aspects of translation as follows: *"First, the translated text must be close to the original. That is, the information in the sentence of the original must be fully reflected in the translated text. Although religious, specific cultural concepts and phraseological units are especially difficult to translate... Second, special attention should be paid to the issue of transparency in translation"* (Etimad, B., 2015). These are the features that are expected in translations from Georgian literary sources. Translation creativity occupies an

important place in the activities of D. Aliyeva, T. Huseynov, M. H. Bakhtiyarli, A. Sarajli, I. Ismayilzade, V. Rustamzade, A. Abdulla, Z. Yaqub, D. Kerem, A. Binnet oglu, M. Chobanov, H. Valiyev, E. Elsever, S. Suleymanli, V. Hajiyev, I. Mammadli and others. Their works were published in various press organs, especially in the newspapers "Sharqin Shafeqi", "Gurjustan", "Var liq" and others, "Cheshme" (1980), "Dan ul duzu" (1987, 1989, 1990), "Bir sinade iki urq" (1981), "Adebi Gurjustan" (2007, 2012) and others. His translations, which are published periodically in a number of collections, are interesting and memorable not only for their literary translation qualities, but also for their artistic and aesthetic attitude and position in national literature. The newspaper "Georgia" (1960–2015), published in Georgia, has also done successful work in the field of literary translation. As in the original works published here, the translations also promote important ideas such as love for the Motherland, love for the people, love for science, education, and friendship. Although the topics of these works are diverse and colorful, the goal and purpose of all of them are the same: to broaden the intellectual and moral views of the growing young generation, along with artistic taste, and to further strengthen the bonds of friendship between our peoples.

The stories of Ilya Chavchavadze " Nikoloz Gost-shabashvili" ("Gur justan" gaz., 17.09.1987), translated by Emin Elsever (Mahmudov), and Nodar Dumbadze "Arzu" ("Dan ulduzu", 1987), were received with interest by the readers. The collection of stories and short stories he collected from well-known classical and modern Georgian prose and published in 1991 by the "Merani" publishing house in Tbilisi under the name "Armagan" confirms that he has gained considerable expertise in the field of short stories. The book includes works such as M. Javakhashvili's "Chakmechi Gabo", "Chan Chura", G. Gamsakhurdia's "Jamu", "Woman's Milk", T. Gogoladze's "Echo", etc. The reality of life is clear in these works, and the plot line of most of them is formed by the Azerbaijani theme, and the life and lifestyle of Azerbaijanis are reflected with love. Of course, "speaking" such classical works of art in Azerbaijani requires hard work and talent from the translator. As stated in the article titled "Another Gift from Georgian Literature" by literary scholar and translator Shurudin Mammadli, published in the July 25, 1991 issue of the" Gurjustan" newspaper: *"The language of his translations is clear, figurative, and the narration is smooth"* (Mahmudov, E., 2010, 67).

Emin Elsever (Mahmudov) has also masterfully translated Ilya Chavchavdze's story "The Widow of the Otar Oyun" (2008) and Jabua Amireji's famous novel "Data Tutashkhi" (2010) into our language and published both works as separate books. The novel "Data Tutashkhi" by the Georgian writer J. Amireji, who became a classic during his lifetime, is one of the rare gospels of the 15th century Georgian literary oeuvre. The writer remained faithful to the national tradition by writing this work for ten years and became an event in the literary environment. The translator writes: " *The development of the empirical and moral-inseparable plot line is clearly visible in the novel. The struggle of the heroes who oppose each other in the work – Data Tutashkhi and Mushni Zarandiyan – can be perceived as a struggle of each person against himself, which comes from his inner world "* (Mahmudov, E., 2010, 3). The writer contrasts the struggle of Good and Evil; on the one hand, conscience, friendship, brotherhood, and on the other, power, which is present in our world, are opposed. Data Tutashkhi is elevated to the level of an ideal image and represents Good, and on the other hand, there is Mushni Zarandiyan, who represents Evil. Although the evil forces are responsible for the death of Data Tutashkhi, Mushni Zarandi, who represents him, ultimately becomes a victim of this struggle, unable to bear the lingering nostalgia for his grandfather Data 's death. The writer describes the last days of the representative of the Eastern forces as follows: "*Later, Mushni Zarandian's illness began with a severe form of melancholia and ended three years later with some serious illness and death. As far as I could determine, the melancholy began after his return to Petersburg from Georgia. I do not want to create an unfounded authorial impression, but I cannot help myself and say: this man of unsurpassed talent had Data Tutashkhi*

as the measure of his own capabilities! If we take into account that a living example is necessary for human existence and activity, and for Mushni Zarandian such a standard was Data Tutashkhi, then we should consider it natural that Mushni Zarandian should also leave this world after the death of Data Tutashkhi." (Amirejibi, J., 2010, 624).

Imir Mammadli's artistic translations from Azerbaijani to Georgian and vice versa, from Georgian to Azerbaijani, enrich mutual relations. The poet and writer, who knows both languages to the fullest, fulfills the mission of a kind of two-way bridge-road between the two peoples. The translated book of poems "I and I" by Cansug Charkviani fulfills this mission. The poet, who has a wide range of intellectual abilities, is able to look at everything in life through the prism of national thinking. In his works, the Georgian heart beats, he dresses them in Georgian national clothes. For him, the idea of being national first, then secular is fundamental:

— Listen, dear, I'll tell you now.
Here is my answer to the baseless complaints:
My sword has clashed with the enemy at least a thousand times
It hit...
It hit...
The color did not fade.
I am with my people;
Believe me, it's still
I didn't have a single moment alone with myself.
I couldn't be a slave to these disasters.
I wanted, I yearned... I didn't have time... (Cansuğ, Ç. 2015; (Mahmudov, E., 2010).

The poet here beautifully expresses his loyalty to his people, his constant breathing with them, in poetic language. Of course, here we cannot agree with the translator's line "I could not be a slave to the happy disasters." Because, Cansuğ is truly a lover of true beauties. He cannot get enough of praising them. So how? If you are a poet, you cannot love the daughters of your homeland! – this is impossible. And it is ten times more impossible for a poet like Cansuğ. In this sense, let's take a look at the poet's poem "I have lost a beautiful girl":

He drinks, but he doesn't enjoy it,
There is no intoxication in his breath.
"A kiss is worth a thousand lives."
The nightingale is in a cage of whites.
I entered the jaw in clouds,
I said, "Let my blood flow!"
Whoever leads me from this path,
May love be his enemy!... (Cansuğ, Ç., 2015; Mahmudov, E., 2010).

Sound very beautiful in Azerbaijani Turkish while maintaining their originality. This is due to Imir's not only being a delicious poet, but also his thorough knowledge of both languages, his unique translation skills, his passion for art, and his ability to make each word a treasure for the Azerbaijani reader by working on it with jeweler's precision and preserving its native color.

Of course, the translations up to Imir Mammadli were made by prominent figures in Azerbaijani poetry who had their own style. However, the fact that both translations were made not from the original, but from Russian inevitably increases the importance of I. Mammadli's translation. Because translation from the original has its own characteristics. For example, there is a line in the poem, where it is said that this is a Persian story. It turns out that this work is a translation from Persian. In fact, that line should be read like this in the translation from ancient Georgian:

This is a Persian story told in Georgian,
Time slipped from hand to hand like a rare pearl.
I found and wrote poetry, I shared in the suffering,
Let the one who understands my mind tell me what I have lost or gained (Mahmudov, E., 2010, 79).

By saying "This is a Persian story," the poet points to the fact that Persian was the language of poetry in the Middle East in the 12 th century, that is, it is a love story told in that language. If it were truly a Persian story, other works on this subject would have appeared in Eastern literature (for example, "Leyli and Majnun" was written by several authors). However, the plot of this poem by Sh. Rustaveli is not found in any other source. In general, as a result of world-wide research

conducted by Rustaveli scholars, it became clear that this plot has not been found in any source since the 12th century.

One of the unique features of the poem is that in world poetry, heavy and light meters have been used according to the course of events. The use of these two meters in the same work is a rare literary phenomenon. Both meters have 16 syllables. When Aftandil goes to look for Tariyel, they ask him why he is leaving his beloved? He replies:

I will be the yellow cucumber in the garden of this world,
The one who sacrifices his life for a friend without saying sorry.
I said goodbye to my sun, I have no choice but to love you,
If I leave him, what is my homeland to me? (Mahmudov, E., 2010, 80).

This world-famous work by Sh. Rustaveli is still known to the Azerbaijani reader under the name "The Warrior in the Leopard Skin". According to I. Mammadli, the poem's such title is the result of the translation from Russian. In the new translation, the poem is called "The Leopard-Skinned Knight". This is more in line with the original. Moreover, in ancient times, tsars wore leopard skins, not tiger skins.

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SCIENTIFIC PROGRESS AS A DYNAMIC NONLINEAR PROCESS

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Absrtact

The article analyzes a number of issues of the philosophical understanding of the concept of "scientific progress" at the modern stage. A comparison of different approaches of philosophers to this concept is made.

The philosophical investigation of the problem was carried out in the interaction of social epistemology, the meanings of scientific progress, and epistemic coercion approaches. In this context, the context of scientific progress of philosophical analyses conducted within the framework of STS and the Great Anthropological Transition is also included.

Keywords*: disciplinarity, interdisciplinarity, nonlinearity, intersubjectivity, extended cognition, epistemic coercion, synergistic integration, natural intelligence, artificial intelligence*

The Oxford dictionary defines "progress" in two senses: 1) development towards something better (развитие в деверь улучшения); 2) upward movement forward (поступательное движение вперед) (OxfordLearner'sDictionary, 2024). We look at scientific progress in the synthesis of these meanings. Therefore, scientific progress is contained in the synthesis of the "further improvement" of science as a system against the background of the existing scientific criteria in a certain historical period and the "forward movement" in understanding. Of course, this is a general approach and there may be alternatives. However, the discussion of the problem in the philosophical aspect is also based on the acceptance of scientific progress in this sense.In this article, we analyze the discussions held regarding TDSokolova's framing of the issue in the context of the conceptualization of scientific progress. An interesting aspect of TDSokolova's approach is that she views the problem in the context of the interrelationship of disciplinary and interdisciplinary forms of organization of science. Here, the philosopher actually sees a serious contradiction in the aspect of philosophical understanding of scientific progress. This contradiction stems from the fact that at the modern stage it is not adequate to unambiguously and completely associate the development of science with interdisciplinarity. Thus, according to TDSokolova, the perception of interdisciplinarity in academic science as the main sign

of scientific progress and the prediction that this process will eventually create new disciplines (in the sense of a new disciplinary differentiation at a new level) do not reflect the real situation (Sokolova, 2023, p. 24).

To substantiate his position, the Russian philosopher mainly refers to English-language research. In particular, he appeals to research conducted within the framework of the STS and the ideas of Federica Rousseau. He emphasizes that "strict disciplinary separation (isolation – FG) is still characteristic of English-language philosophy" (Sokolova, 2023, p. 25). TDSokolova draws this conclusion from the ideas of F. Rousseau. F. Rousseau writes that even philosophers working in the spheres of philosophy of science and philosophy of technology are "impenetrable to each other". At the theoretical level, this means that philosophers differ in subject, approach, methodology and even paradigm. This also separates researchers in that sphere from each other both in publishing the results of their work, in various scientific events, and in referring to each other. In practical terms, this situation leads to a limitation of understanding in scientific activity. For example, it "creates a gap" in understanding the interaction between fundamental sciences and technical development (Russo, 2022, p. I–XXIV and 1–10).

Although the research conducted within the framework of the STS is dominated by an interdisciplinary approach, it is to some extent "tends to be self-contained" [Sokolova, 2023, p. 25]. The researchers themselves emphasize that the main problem of research is the expansion of expertise and the involvement of a larger number of researchers in the search for scientific truth (Jasanoff, 2017, pp. 260–287; Latour, 2017).

Savings

Within the logic of the discussions conducted, it becomes clear that the philosophical reflection of scientific progress at the modern stage is a complex process. There is no unanimous position of philosophers on this. At the same time, the philosophical understanding of scientific progress requires, in addition to the consideration of the cognitive aspect, socio-cultural and technological aspects in a complex, appropriate expert assessment.

Currently, an approach that could synthesize the highlighted aspects into a single theoretical-epistemological and methodological field has not been formed. Here, in the context of the relationship between disciplinarity and interdisciplinarity, the third characteristic included by I. T. Kasavi ("the integration of knowledge in the form of disciplinary institutionalization of a number of areas of interdisciplinary interaction") does not seem to be sufficient to adequately define scientific progress. Because the understanding of disciplinary institutionalization as a form of integration of knowledge in the aspect of interdisciplinarity is generally a useful definition, but it is not sufficient for an adequate philosophical understanding of scientific progress. The point is that in the modern era, scientific progress can be adequately understood in the context of a single position that can be formed in the field of interaction of cognitive (purely cognitive), social, cultural, psychological, technological and other spheres. I explain the reason for the main contradictions that currently arise in the philosophical reflection of scientific progress with this point.

It is understood that the philosophical understanding of the issue of scientific progress at the present stage is generally not set correctly. That is, the cognitive, epistemological, conceptual and methodological capabilities of existing approaches do not have the capabilities that would allow for an adequate philosophical understanding of scientific progress. In this issue, a paradox has arisen between the results of scientific progress and the understanding of the various factors that create them. The factors that condition scientific progress are understood philosophically adequately separately (for example, within the framework of social epistemology and its modern modifications), but this is not enough for the philosophical understanding of scientific progress, which is the effect of the synergistic integration of these conditions. Scientific progress from this point of view is a complex self-organizing, nonlinear and dynamic process. In this sense, scientific progress as a single system is greater (more, more) than the sum of its constituent parts.

An adequate philosophical understanding of scientific progress may be possible at the stage of the formation of a new level of re-

lations between the factors that condition it. Therefore, we conclude that science has yet to make a breakthrough in the direction of artificial intelligence and the latest technologies. We can also call this the Great Anthropological Transition. However, this is not an absolute condition. The main condition will be the invention of a "new creative being", a representative of the human-artificial intelligence symbiosis.

The main reason for my understanding of scientific progress in this context is that, on the one hand, the relationship between philosophical and scientific cognition is at a stage of rising to a new level, and on the other hand, human cognition in general is approaching the next stage of expansion. Therefore, scientific progress can be adequately understood in the field of "expanded epistemology of cognition" (this direction is being developed in various variants) within the framework of "philosophical-scientific cognition" in a new quality.

Thus, the fact that scientific progress can be adequately reflected upon in the unity of philosophy and scientific understanding, in the "emergent interface cognitive zone" that synthesizes them, is precisely due to the emergence of a new "creative intersubjective scientist" who will be an example of the symbiosis of natural intelligence + artificial intelligence. Therefore, the discussions currently underway around the philosophical understanding of scientific progress are extremely important.

Conclusion

The article's analysis of current discussions in the context of scientific progress provides grounds for drawing several conclusions.

The topic of "scientific progress" is very relevant for modern philosophy, philosophy of science and epistemology. Here, the interaction of both the logic of internal renewal of science and its socio-cultural context is an important condition. In the field of joint understanding of these two aspects, scientific progress includes the main features of the development of science in the context of the development and humanization of society as a whole.

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PROBLEMS OF GENETIC MODIFICATION WITHIN THE FRAMEWORK OF ETHICS AND LAW

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Abstract

This paper explores the legal framework of genetic modification within the context of ethics and law. Genetic engineering and modification introduce new ethical and legal dilemmas by intervening in the biological nature of humans. The field of bioethics upholds fundamental principles such as non-maleficence, social equality, and individual privacy. Genetic modification, while applicable across various domains – from medical advancements to aesthetic and social enhancements – raises serious legal and ethical concerns.

Keywords: *bioethics, human rights, genetics, law, genetic modification technologies*

Bioethics and Genetic Modification: A Conceptual Framework

Bioethics is a field that explores ethical issues affecting human life, health, and well-being. The principles of bioethics encompass a wide range of areas, from health policies to medical decision-making. One of the most fundamental principles is the principle of autonomy, which upholds an individual's right to make decisions regarding their own body and health. Autonomy signifies the right of individuals to control their lives and make independent decisions regarding their well-being. This principle does not only involve the right to be free from external intervention but also includes the right to self-determination and independent decision-making regarding one's life (Beauchamp, 19).

In the field of genetic modification (GM), the application of this principle becomes more complex, as the issue extends beyond the immediate medical procedures to interventions affecting the genetic structure of future generations. Ethical concerns in genetic interventions arise both from an individual and a collective perspective: while an individual may have the right to alter their genetic makeup, such interventions may also impact the lives of future generations.

The application of the autonomy principle requires that individuals provide fully informed consent regarding decisions affecting their bodies and health. This is particularly critical in the medical field, as procedures – especially complex interventions like genetic modification – can significantly alter a per-

son's life. Informed consent demands that individuals fully understand the benefits, risks, and possible consequences of a given medical intervention before agreeing to it (Faden & Beauchamp, 1986).

When it comes to genetic modification, particularly in cases of embryonic or genetic testing, obtaining informed consent becomes even more intricate. Even if an individual consents to a modification, its consequences may have far-reaching ethical and legal implications for future generations. If a parent decides to modify their child's genetic structure, this decision not only affects that child but also has potential consequences for subsequent generations (Savulescu, 780–781). This situation highlights the challenges of the autonomy principle and the ethical complexities of genetic manipulation.

The implementation of genetic modification raises significant interventions affecting human bodies and lives, bringing legal concerns to the forefront. Firstly, there must be clearly defined legal boundaries regarding genetic interventions. For instance, laws and policies governing an individual's right to alter their genetic code are still evolving and vary across different countries (Rothstein, 555). While some nations have implemented strict regulations limiting genetic modifications to medical purposes, others allow such interventions with greater freedom. These legal discrepancies raise serious concerns regarding the protection of individual rights.

Additionally, the impact of autonomy and individual rights on society and collective well-being must be considered. Genetic modification, while enhancing individual choice, may also have implications for societal welfare. For instance, issues such as how genetically modified individuals integrate into the labor market, whether they confer social advantages, or whether they foster discrimination against those with natural genetic variations become pertinent (Buchanan, 2019).

Bioethics serves as a field that examines ethical issues in medicine and science while considering human well-being, rights, and social justice. A fundamental principle in bioethics is justice and equality. These principles aim to ensure that every individual in society is treated fairly, that resources are allocated equitably, and that decisions affecting quality of life are made justly. Justice and equality in bioethics play a crucial role, particularly in ensuring equitable access to medical services and resources.

2. Ethical and Legal Issues of GMOs in Azerbaijan

Legislation on import, circulation and use of GMO products in Azerbaijan. Although efforts have been made to define the regulatory framework, legal mechanisms in Azerbaijan regarding genetic modification are yet to be fully developed. For instance, while laws such as the "Law on Environmental Protection" and the "Law on Consumer Rights Protection" address GMOs indirectly, the absence of a dedicated legal framework creates a significant legal gap. This gap poses serious risks both for public health and the preservation of ecological balance (Mammadov, 155–156).

From an ethical standpoint, the principal concern lies in the lack of clearly defined boundaries for human intervention in nature and the potential misuse of such technologies for commercial purposes. According to certain bioethical principles, interference with the genetic structure of human beings or nature should only be permitted under specific conditions – such as medical necessity and public consent. This necessitates the development of a comprehensive normative framework for bioethics in Azerbaijan.

Although international instruments such as UNESCO's Universal Declaration on Bioethics and Human Rights provide ethical guidelines for genetic interventions, the effective implementation of these principles at the national level remains unresolved. Institutional structures in Azerbaijan – such as the Institute of Philosophy and Sociology of the Azerbaijan National Academy of Sciences (ANAS) and the UNESCO Chair in Bioethics – have initiated several projects in this area. However, their integration into the formation of practical legal and social mechanisms is still limited (Mustafayeva, 22–24).

The philosophical dimensions of bioethics hold particular significance in Azerbaijan. One of the most prominent scholars in this field is Professor Ilham Mammadzade, whose research offers an in-depth philosophical grounding of bioethical issues by analyzing

ethical principles not only from medical and legal perspectives, but also from ontological and anthropological viewpoints. His work underscores that bioethics should not be perceived merely as a normative system, but as a philosophical foundation that safeguards human moral integrity and the freedom of individual choice. Several projects have been undertaken at the Institute of Philosophy and Sociology of ANAS to develop a philosophical framework for ethical concepts (Mamedzade, 123–124).

In addition, the low level of public awareness on this subject significantly impacts the quality of ethical decision-making. The lack of public debate and limited transparency regarding genetic modification hinders the establishment of accountable and ethical decision-making mechanisms.

Scientific controversies surrounding the environmental and health-related effects of GMOs also contribute to the uncertainty in ethical judgment. While the application of the precautionary principle is deemed necessary in ethical decision-making, its insufficient reflection in the Azerbaijani legal system further exacerbates existing gaps.

In conclusion, the application of genetic modification technologies in Azerbaijan raises not only scientific and technological questions, but also profound ethical and legal challenges. It is crucial to strengthen institutional initiatives, improve relevant legislation, and promote public dialogue in this domain. At the same time, ethical decisions should be justified not only within legal frameworks but also through philosophical and cultural contexts, in order to foster a more balanced and responsible approach to genetic modification.

Conclusion

Legal and ethical regulation in the field of genetic engineering remains a challenging issue. The application of genetic modification should not only be guided by medical and scientific approaches but must also align with the ethical and legal values of society. Ensuring that genetic interventions are carried out solely for health-related purposes is crucial for defining ethical and legal boundaries. The global implementation of these regulations through joint cooperation is essential. Strengthening international collaboration and oversight mechanisms can help protect ethical standards in genetic engineering.

Furthermore, the regulation of genetic engineering should not be limited to medical and scientific aspects but must also be applied in accordance with social equality and human rights. The protection of genetic data and the assurance of personal privacy are fundamental principles for the successful implementation of ethical frameworks in this field. Legal regulations should also emphasize the importance of informing society and implementing ethical education programs. Raising public awareness in this area will facilitate the adoption of ethical and legal approaches in decision-making processes.

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Contents