RUDN Journal of Economics
Вестник Российского университета дружбы народов.
Серия: Экономика

ISSN 2313-2329 (Print); ISSN 2408-8986 (Online)
2023 Vol. 31 No. 4 700–711
http://journals.rudn.ru/economics

МИРОВОЙ РЫНОК КАПИТАЛА

GLOBAL CAPITAL MARKET

DOI: 10.22363/2313-2329-2023-31-4-700-711
EDN: QEXDYD
UDC 330:336

Research article / Научная статья

High technologies and artificial intelligence as driving factors in the evolution of the world financial and economic architecture

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Abstract. The current dynamics of the development of the world economy is gaining new momentum despite the high crisis dynamics, containing financial, economic, monetary and geopolitical parameters. The factors accelerating the transformation of the global financial and economic architecture (GFEA) are high technologies, including the digital economy and artificial intelligence. The purpose of the study is to study the dynamics of the development of high technologies and its contribution to the evolution of the global financial and economic system. To conduct this analysis, the work uses a wide range of different scientific methods and approaches — the methodology of system analysis, methods of historical, logical and comparative analysis. Technologies are analyzed according to seven groups of impact on the GFEA transformation process: blockchain technologies, 3D printing, the Internet of Things, mobile broadband, cloud computing, robotics, and artificial intelligence. Their economic contribution to the processes under study is given. The activities of the Singularity University are considered as an example of a transnational think tank engaged in scientific and applied synthesis of high technologies, analysis of their prospects and consequences of their influence on the life of society. Proceeding from this, the contours of the further development of the GFEA and the strategies of behavior in the new conditions are given.

Keywords: global financial and economic architecture, world financial system, artificial intelligence, digital economy, internet of things, evolution, high technologies, technological singularity

Article history: received August 19, 2023; revised August 31, 2023; accepted September 14, 2023.

For citation: Smirnov, F.A. (2023). High technologies and artificial intelligence as driving factors in the evolution of the world financial and economic architecture. *RUDN Journal of Economics, 31*(4), 700–711. https://doi.org/10.22363/2313-2329-2023-31-4-700-711

Высокие технологии и искусственный интеллект как движущие факторы эволюции мировой финансово-экономической архитектуры

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Аннотация. Современная динамика развития мировой экономики набирает новые обороты, несмотря на высокую кризисную динамику, содержащую финансово-экономические, монетарные и геополитические параметры. Факторами ускорения трансформации мировой финансово-экономической архитектуры (МФЭА) выступают высокие технологии, включая цифровую экономику и искусственный интеллект. Цель исследования — изучить динамику развития высоких технологий и ее вклад в эволюцию мировой финансово-экономической системы. Для проведения данного анализа в работе используется широкий спектр различных научных методов и подходов — методология системного анализа, методы исторического, логического и сравнительного анализа. Анализируются технологии по семи группам воздействия на процесс трансформации МФЭА: блокчейн-технологии, 3D-печать, «Интернет вещей», мобильная широкополосная связь, «облачные» вычисления, робототехника, искусственный интеллект. Приводится их экономический вклад в исследуемые процессы. Рассмотрена деятельность Университета Сингулярности как пример транснационального мозгового центра, занятого научно-прикладным синтезом высоких технологий, анализом их перспектив и последствий влияния на жизнь социума. Исходя из этого, даются контуры дальнейшего развития МФЭА и стратегий поведения в новых условиях.

Ключевые слова: глобальная финансово-экономическая архитектура, мировая финансовая система, искусственный интеллект, цифровая экономика, интернет вещей, эволюция, высокие технологии, технологическая сингулярность

История статьи: поступила в редакцию 19 августа 2023 г.; проверена 31 августа 2023 г.; принята к публикации 14 сентября 2023.

Для цитирования: *Smirnov F.A.* High technologies and artificial intelligence as driving factors in the evolution of the world financial and economic architecture // Вестник Российского университета дружбы народов. Серия: Экономика. 2023. Т. 31. № 4. С. 700–711. https://doi.org/10.22363/2313-2329-2023-31-4-700-711

Introduction

Today we are at the very beginning of the high-tech evolution of the development of the world. The fundamental difference between this development and what it was before is that human life will be fully synthesized with a wide range of technologies.

There will be a mutual interweaving of high technologies and human life. The life of the latter without technology will become almost impossible. It was previously impossible without them, but the degree of interconnectedness will reach serious proportions that will make it possible for the emergence of a new biotechnosphere — an independent ecosystem.

In this way, we will be interested in the question of how to most effectively trace the origin and development of the global high-tech trend, understand the laws of its dynamics and impact on the life of society. Here, another question seems fair: how will humanity be able to dispose of such a level of development — that is, whether these technologies will benefit him, and a person will use the freed time for self-improvement, or, on the contrary, will wallow in laziness and decay, since doing nothing will be needed. This is what determines the structural decomposition of the impact of high technology development on the global financial and economic architecture (GFEA). This process is multifaceted and will require a detailed study of various aspects of the whole problem, which will require significant research time and many scientific publications.

Any technology is a prosthesis that enhances or enhances human capabilities. Without the technologies that surround us today, without each of them, we will not be able to reach a new level of development. They all intersect. High technologies are the means by which you can get the effect of exponential growth — the economy, knowledge, intelligence capabilities — that is, the development that is so necessary for all mankind today. Therefore, if we consider these technologies as an opportunity to do something meaningful, then their positive impact on the GFEA will be economic growth, not only quantitative, but also qualitative.

Literature review

Although the dynamics of global processes is today the subject of research by a fairly large number of world-famous scientists, some of whom pay attention to very specific aspects of such global development, however, the deep development of the issues of the impact of high technologies on our lives is still at an early stage of research. The same applies to the question of the impact on the process of evolution of the global financial and economic architecture.

It is important to mention the study conducted by Professor of Economics at the University of Maryland K. Reinhart and the famous American economist K. Rogoff "This time is different. Eight Centuries of Financial Folly" (Reinhart, Rogoff, 2009). In this work, the authors summarized information on economic and financial crises, as well as banking shocks — over the past 800 years (although most of the data they still provide is for the last 300 years). However, the main conclusion that scientists come to is the following — as the world approaches the current moment, the frequency of crises increases, their duration decreases, and the strength and depth increase. This trend is gaining its greatest manifestation in the 20th and early 21st centuries. At the same time, which is important, each period of instability is individual and has its own reasons. The same dynamics

coincides in time with the growing intensity and expansion of the use of high technologies, which in recent years, due to the development of the digital economy, are increasingly transnational in nature.

Against this background, the results of the French economist T. Piketty "Capital in the Twenty First century" (Piketty, 2014) are indicative, where he analysed the actualizing problem of inequality based on a significant number of sources. This scientist recorded that rapid economic growth, although accompanied by a reduction in the concentration of capital and its role in private hands, nevertheless leads to a reduction in inequality, while the suspension of growth is accompanied by an increasing value of capital and inequality. Today, inequality is steadily gaining strength, which provokes the threat of severe social and political upheavals. It is likely that with the competent development and implementation of technologies, this problem will lose its significance and will be progressively resolved.

In turn, the Americans J. Rickards, R. Duncan and multibillionaire R. Dalio go further, actually exposing the deep flaws of the American-centric global financial and economic architecture. Thus, J. Rickards, using an interdisciplinary approach, focuses on the causes of major crises associated with the imperfection of the processes of distribution of financial resources and the operation of the exchange mechanism (Rickards, 2016). R. Duncan, using extensive statistical material, reveals structural imbalances in the US economy, stating that the excessive accumulation of loan capital, its immense use in the real sector of the economy, leads to a gradual increase in crisis processes (Duncan, 2005, 2022). In turn, the problems of capitalism are reflected in the works of the practitioner R. Dalio (Dalio, 2018), who draws attention to the importance of large cycles in the economic development of countries and regions of the world.

However, in addition to such aspects of the development of the world economy and finance, the addition of a number of factors that have a direct impact on the evolution of the IFEA, although they do not manifest themselves clearly in the closest time range, is of high relevance. We are talking about the high-tech segment, to which, in particular, the works of A. Ross (Ross, 2017), K. Schwab (Schwab, 2017) and the founders of the Singularity University — R. Kurzweil (Kurzweil, Grossman, 2010) and P. Diamandis, as well as the researcher of this problem — S. Kotler (Diamandis, Kotler, 2016).

Methods

When writing the article, the author used a wide range of different scientific methods and approaches. The methodology of system analysis was used, which made it possible to bring together an extensive database of multidirectional crisis processes. Methods of historical, logical and comparative analysis made it possible to trace the dynamics of the impact of high technologies on the global financial and economic system.

Atkinson R., (Atkinson, 2021), Bremmer I. (Bremmer, 2021), Darby C., Sewall S. (Darby, Sewall, 2021), Duncan R. (Duncan, 2005, 2022), Hall, S., Li C. (Hall, Li, 2021), Hongbing Song (Hongbing Song, 2015), Kurzweil R., Grossman T. (Kurzweil,

Grossman, 2010), Mauro C., Dehghantanha A., Franke R., Watson S. (Mauro, Dehghantanha, Franke, Watson, 2018), Mirkin Y. (Mirkin, 2020), Russell S., Norvig P. (Russell, Norvig, 2021), Slaughter J., McCormick H. (Slaughter, McCormick, 2021), Shiller R. (Shiller, 2005).

Results

Crisisogenicity of global development. The complication of the financial world order, accompanied by the emergence of an additional significant number of actors and new connections between them, as practice shows, is accompanied by an increase in the strength of crises. And due to the strengthening of the economic interweaving of objects and subjects of the global financial and economic architecture, the increase in the level of their "connectivity" — absolutely the entire system suffers from shocks, including participants who have nothing to do with such crises at all.

An important new aspect of this process is high technology, which also strengthens the ties between the participants of the entire system. First of all, we are talking about such developments as, for example, sensors and sensors, the Internet of things, cloud computing services. Together, they strengthen the connectivity of the global financial system. Increases the speed of decision making.

The processes currently unfolding are unique in their depth. They combine worsening financial and economic imbalances, both in the global economy and in global finance. A similar list of crises is published on an annual basis by experts from the World Economic Forum in Davos (WEF). WEF specialists are preparing a Global Risk Report covering many areas of life for all mankind[1].

The sum of technologies is on the way to the singularity. At the current point in time, it can be argued that the totality of developments in the field

- robotics;
- data transmission (5G networks, blockchain technologies);
- data processing (quantum computing);
- data storage (Gordon Moore's law, according to which the number of transistors placed on an integrated circuit chip doubles every 24 months);
- life extension (biomedicine);
- process automation (unmanned vehicles, industrial robotics, implanted language translation algorithms, "smart home" and Internet of things);
- artificial intelligence

allows us to talk about the cardinal transformation of our lives in the next 5–10 years.

Among the main high-tech trends that will be useful to us further for a more voluminous understanding of reality, the following can be distinguished:

[1] The Global Risks Report 2023. 18th Edition. Retrieved April 10, 2023, from https://www3.weforum.org/docs/WEF_Global_Risks_Report_2023.pdf

- sensors and influencing devices, including implantable and mobile, that help us get more information and experiences from more objects in more places, which affects the environment;
- ubiquitous computerization (distributed computing) and hyperconnectivity, which exponentially increase the flow of data between people and their devices, as well as just between devices;
- nanotechnologies and nanomaterials, which allow us to build more and more complex, but at the same time microscopic devices;
- artificial intelligence, in which algorithms are increasingly capable of making decisions based on past actions and desired outcomes;
- vision as an interface for controlling augmented and virtual reality;
- blockchain technology that allows you to make all types of digital transactions secure, verifiable and even potentially automatic.

In 20 years we may not use cell phones, the Internet of things economy will be on the agenda. By this time, most items will have chips that communicate with each other.

Nanotechnology in clothing could send environmental data to a smartphone or charge it with electricity generated while walking. But why carry a phone around when any glass surface — a bathroom mirror or a kitchen window — can become an interactive interface for viewing a calendar, checking email, watching videos, and everything else we do today on our phones and tablets? Why carry a phone when connecting through the environment will allow us to just talk to each other from a distance without any devices.

Ray Kurzweil, the founder of the Singularity University, names the date when scientific and technological progress will reach the point of technological singularity as early as 2045. This is the point in time when artificial intelligence, cloud robotics and neural networks will be able to self-improve offline without any human intervention.

Artificial intelligence and the Internet of things. The Internet of Things is a single network that connects the objects of the real world around us and virtual objects. This is not only a set of devices and sensors connected by wired and wireless communication channels and having access to the Internet, but the potential close integration of the real and virtual worlds.

In the future, such “things” will become active participants in various processes, including business and social and information relations, in which they will be directly involved. Such a network of interaction will be built on the basis of a huge number of various sensors that read information and serve as indicators of the state of the environment, providing the necessary reaction and performing the necessary actions without human intervention.

The economic value created by the Internet of Things will exceed $11 trillion by 2025 (Tom Siebel, 2021), of which $3.7 trillion will be in industry, $1.4 trillion in healthcare and sports, $740 billion self-driving cars, $850 billion for the logistics sector, $1.7 trillion for healthcare and transportation, $1.2 trillion for retail automation, and $350 billion for home automation. This will give the following.

First, there will be a process of universal identification of each object.

Secondly, a local network of own "things" is formed — the best example here is a smart home, in which all technological items are interconnected.

At the third stage of development, the Internet of Things will spread to the city level. This is already happening in some localities in China. It turns out a smart city in which all data related to residents and the processes taking place in this locality are automated. It is further assumed that such cities will be interconnected, forming networks of the next generation.

Artificial intelligence (AI) is a mathematical model created by analogy with biological neural networks. This is an advanced tool, a kind of prosthesis that significantly enhances the analytical capabilities of a computer. AI technologies are actively developing today, constantly undergoing self-learning on the basis of gigantic arrays of data accumulated by mankind — big data, using the capabilities of the Internet, as well as the Internet of things.

The huge technological capabilities of artificial intelligence systems are integrated into digital services (social networks, news aggregators, search engines, etc.), significantly expanding the tools of information and telecommunication technologies (ICT) in terms of impact on people, impact on economic processes across entire countries. Today, AI in the global digital space is essentially an unregulated tool for the economic influence of the owners of "digital platforms" that set modern trends — consumer, socio-cultural and socio-political.

In November 2020, in the journal of the US National Academy of Sciences, American scientists published the results of their study on the ability of AI to manipulate the human mind when making decisions. "Trained" properly, AI is able to identify "vulnerabilities" in the thought processes of decision-making and, by influencing them, push a person to a certain choice. Moreover, such a choice will be perceived by a person as exclusively his own, based on the principle of "free will", and not imposed by a cunning machine.

Under these conditions, the formation of a universal international legal framework becomes unlikely in the foreseeable future. To illustrate, six of the seven most valuable companies in the world are American and Chinese ICT giants. They actively develop and use AI algorithms in their digital platforms and services (Microsoft, Amazon, Google, Apple, Facebook, Alibaba and Tencent).

With the continuing polarity of approaches in the international community to the regulation of modern ICT, AI developers and operators will take advantage of this uncertainty and regulatory vacuum. At the same time, in the struggle for users, the latter will purposefully form new criteria for evaluating and perceiving information, pushing them to a certain algorithm of actions (choice) modelled in advance by the "customer".

Changing the global management system. The global international management system, which connects not only state mechanisms, but also supranational institutions and organizations of the UN system, will undergo significant changes in the foreseeable future. The main reason for this will be the

rapid development of high technologies, which will not only change human life, improving or simplifying our life support operations, but will also affect our perception at a deep level.

Such a multifactorial world transformation will capture all aspects of human life, also affecting the development of the world economy and the functioning of the GFEA.

In fact, technology today has led to the formation of the so-called the Technosphere, that is, the artificial shell of the Earth, which makes it possible to ensure the movement of the development of all mankind, including in the innovative direction. Moreover, as this process deepens, there is such a development of technologies that, without their participation, the vital activity of a person and society in principle becomes impossible.

However, if we ask ourselves the question of the quality and sustainability of such a Technosphere that would bring humanity to a qualitatively new level of development, then it is quite possible to assert that the leading countries of the world today are only reaching such a "starting point". It will be the beginning of the formation of such a Technosphere that will work on the basis of a global digital technological platform that will radically change or transform the entire habitual way of life of a person.

Experts at the World Economic Forum in Davos have calculated that the impact of digitalization on industry and society, which can cover all levels of business and government, can lead to the creation of an additional volume of "production" in the amount of $100 trillion over the next decade.

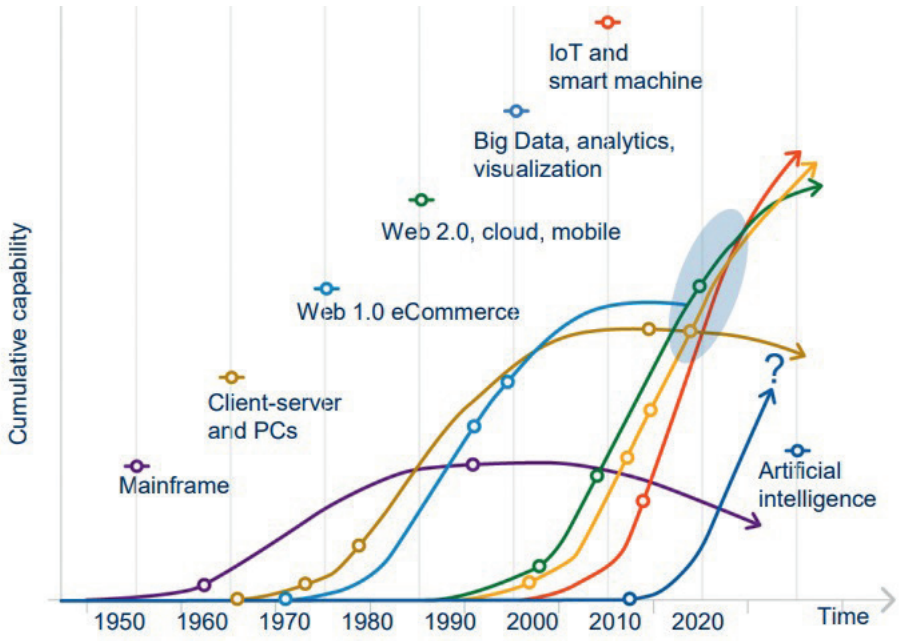

Figure 1. Forecast growth dynamics of critical technologies

Source: World Economic Forum, Assenture analysis (accessed: 18.07.2023).

Cheaper and better technologies are creating a more connected world: the number of devices connected to the Internet now exceeds 8 billion, while by 2030 this number will grow to 1 trillion.

Global Internet Protocol (IP) traffic, a proxy for data streams, has exploded over the past two decades. In 1992, the global Internet transmitted approximately 100 gigabytes (GB) of traffic per day. Ten years later, it reached 100 GB per second. In 2017, traffic skyrocketed to over 46.6 TB per second, and in 2022, global IP traffic is at around 150 TB per second.

The effect of increasing mutual action of various technologies, such as mobile, "cloud", sensory, analytical, IoT, will accelerate the dynamics. Technology has a multiplier effect.

Virtual (VR) and augmented reality (AR) technologies can become one of these multipliers. They can act as pop-up hints, serving as a kind of encyclopedia of knowledge that helps in the activities of scientists/researchers, or they can act as a streaming channel of various, often completely useless, mostly entertaining information that "clogs the air".

Key technological areas that can have a significant impact on the process of transformation of the GFEA

1. Blockchain technologies. Blockchain technology is a form of distributed ledger that allows multiple parties to participate in secure, trusted transactions without any intermediaries. This is, perhaps, the key element of this technology, which puts it in the first positions, since, in the case of the spread of the practice of its use, including in the form of smart contracts (Smart Contracts), there will be no need for any intermediaries of such transactions, primarily, banks. Today, this technology is known as the basis of cryptocurrencies, allowing for digital identification, property rights and compensation.

According to the forecasts of leading international organizations, by 2027–2030 the blockchain technology industry is about to explode, reaching the $3 trillion mark globally by that time.

2. 3D printing. 3D printing, also known as additive manufacturing. The risk of its accelerated spread lies in the potential disruption of production processes due to increased international trade in similar samples, rather than finished products. It enables developing countries to "leapfrog" traditional production processes. 3D printing businesses in Africa, for example, are geared towards making medicines in Uganda, filling import gaps in Nigeria, commercial enterprises in South Africa, and renewable energy in Rwanda. 3D printers are also being used to create prostheses in Cambodia, Sudan, and Uganda.

3. Internet of things. The Internet of Things includes all devices connected to the global network — various sensors, counters, radio frequency identification chips, other gadgets that are embedded in everyday objects, allowing them to send and receive data.

4. Mobile broadband. 5G wireless technology is expected to be critical to the accelerated development of IoT technology due to its greater ability to process significant amounts of data. 5G networks can handle about 1,000 times more data than current systems.

5. Cloud computing. Cloud computing is possible due to the higher speed of the Internet. The cloud is transforming business models as it reduces the need for in-house IT professionals.

6. Robotics. Robotics can have a significant impact on employment. It is becoming more and more popular when used in manufacturing, military and agricultural aviation, in road transport, in emergency situations, and in space exploration.

7. Artificial intelligence. AI developments, including machine learning, are made possible by large amounts of digital data that can be analysed to predict behaviour using algorithms. AI is already being used in areas such as voice recognition and commercial products. By 2030, the volume of production will be about $13 trillion.

Generative AI has the potential to create up to $4.4 trillion worth of annual value in the global economy. $4.4 trillion is the high end of a range, with the lower bound sitting at $2.6 trillion. Even if the value created were to fall on the low end, it would still approximate the GDP of the United Kingdom, which was $3.1 trillion in 2021.

How will that happen? Mostly by automating and accelerating work that's currently done by humans, allowing humans to do more work in the same amount of time. That makes both us and AIs sound like nothing more than workhorses, but here's an example.

Resent McKinsey study[2] detailed how generative AI impacted the work of customer service agents at a software firm. The AI monitored agent interactions with customers in real time and gave them suggestions for what to say. The agents who used the AI resolved 13.8 percent more issues per hour than they'd been able to without it; they got through calls more quickly, resolved more complaints successfully, and could even handle multiple calls at once. The AI also cut down the time managers had to spend training new employees, enabling them to take on bigger teams — and ultimately allowing the company to hire more employees and do more business.

Singularity University

SU helps leaders adapt to a world of accelerating change and empower them to leverage tech to improve the lives of one billion people over the next five years.

In 2008, Peter Diamandis and Ray Kurzweil stood up in front of an audience of the Silicon Valley elite, the CEOs and venture capitalists creating exponential future. Diamandis and Kurzweil proposed the creation of a new University that gathered top entrepreneurs from around the planet to learn about AI, Robotics, 3D Printing, Biotech, AV/VR, and Networks and how these technologies could be used to solve the world's biggest programs.

During the past 14 years, since SU's founding, Singularity has graduated over 20,000 exponential entrepreneurs in more than 100 countries.

[2] The economic potential of generative AI: The next productivity frontier — 2023. Retrieved April 10, 2023, from https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier#introduction

Conclusion

High technologies provide a whole range of different benefits, the tangible positive effect of which has yet to be assessed. One of these factors is speed, when we talk about the speed of information transfer, more precisely, its volume and expanding qualitative composition, as well as the speed of production, communication, or information processing. The latter is in the power of artificial intelligence, which is only gaining strength. The extent of the impact of AI on the world system is still difficult to grasp, but here we can draw an analogy with a "genie in a bottle" that is waiting in the wings. It's all about the accumulation of a critical mass, which over time will grow from quantity to quality, if certain legal and / or moral and ethical frameworks for the development of this technology are not established. However, this is a topic for another independent study.

The impact on the transformation of the global financial and economic system is manifested in the degree of participation of these technologies in its life. If blockchain technology gives life to Central Bank Digital Currencies (CBDC), as well as a wide range of cryptocurrencies, then AI technology will allow over time to work with the imperfections of the entire system, as various financial players, banks, hedge funds currently do. The digital economy is inherently impossible without high technologies that provide broadband information transfer, or cloud computing. The issue is that this entire set of developments requires regulation, since it affects transnational processes, increasingly reaching the level of intercountry global interaction. For example, cybercrimes in the financial sector are often able to have a significant impact on the operation of the financial system of a country, up to temporarily stopping its work, but the source of their origin is difficult or impossible to determine. Speaking about the GFEA, it is important to take into account that its entire being in the coming years will adapt to the challenges of high technologies. This will entail the need to change the work of institutions responsible for regulating supranational processes in the global economy and global finance.

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Bio note / Сведения об авторе

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