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Надійшла до редакції 25.03.2015

УДК 622 (09)

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## **ГІРНИЧА СКЛАДОВА ЕПОХИ ВЕЛИКИХ ГЕОГРАФІЧНИХ ВІДКРИТТІВ**

У статті аналізуються основні рушії епохи Великих географічних відкриттів (ВГВ), зокрема прагнення до коштовних металів Нового світу; систематизовано історичний огляд опанування мінеральних скарбів Іспанської Америки, розглянуті основні осередки видобутку золота й срібла, показана роль конкістадорів в організації гірничих робіт і доля автохтонного населення, змушеного працювати в численних рудниках, оцінене значення мінеральних ресурсів Нового світу для становлення світової фінансової системи й міжнародної торгівлі XVI - XVII ст.

*Ключові слова: географічні відкриття; мінеральні ресурси; історія гірництва; конкістадори; ельдорадо; гірнича колонізація територій; освоєння надр; гірники-невільники; міжнародна торгівля; "іспанська недуга".*

**Problem definition and exploration state.** The period of Great geographic discoveries (the 15<sup>th</sup>-17<sup>th</sup> centuries) was scrutinized by historians, geographers, economists and literati of different times and peoples but it is also the object of unflagging attention today because its results had a profound influence on the historical development of mankind and processes which mold contemporary international and economic relations [1-4]. The overwhelming majority of such studies and publications focused on geographic discoveries themselves, outstanding personalities of great travelers and details of their renowned trips, the historical background and impacts of discoveries on social and economic development. However, scientific investigations of the GGD period mostly skipped mining and geological factors as well as the role of mineral resources or placed marginal importance on them. Presumably, the first person who attempted to shift away from ignoring natural as well as mining and technology factors in feudal colonization of new vast territories was Academician Volodymyr Vernadskyi. His works *Outlines of history of modern scientific world outlook and Descriptive mineralogy experience* comprise some remarks on this subject and examples

of eloquent interrelations between resource and new territory development [5, 6].

**The goal** of the paper is generalization and systematization of data on the initial colonial development of mining on New World territories 'discovered' by the Europeans and in other areas of 'Great geographic discoveries', an analysis of interrelations between development of mineral resources and new territories as well as mining and geologic (natural) factors and socio-historical development of the GGD epoch.

**Presentation of the basic material.** The sustainable development of production and commodity-money relations in the late Middle Ages necessitated a considerable expansion of the means of exchange, which was manifested in irrepressible strive for 'money' metals. Trade with the Orient carried on through the Arabic World also required gold and silver whereas life of luxury and accumulation of jewelry by the upper classes of European society further increased a 'general itch for gold'. In the situation where well-known fields of Europe were considerably exhausted at accessible depths, search for high-grade deposits was associated with new remote localities where mineral resources would occur almost on the

surface and no great efforts would be presumably needed to access them. Such views were supported with evidence of some travelers regarding the wealth of the Orient, whose stories were widely disseminated once printing had been invented. The development of the Great geographic discoveries epoch was underpinned by two major material bases - commercial benefits and search for precious metals, which became an important factor of political and economic development as well as a reason for mass migration of people to new lands. The utilitarian drives of the new epoch were however supplemented with the ideological ones. According to Volodymyr Vernadskyi, 'the urge to propagate Christianity among pagans, which was similar to Crusades, became the greatest impetus for discovery of the new world' [5].

Wars of the Portuguese with the Arabs in North Africa allowed to establish for a fact that there were lands with rich deposits of gold somewhere south of the Sahara, which was delivered to the Arab World via caravan tracks. Portuguese Prince Henry the Navigator, a famous organizer and inspirer of crusaders' marine expeditions (the 15<sup>th</sup> century), set a goal of discovering those lands with the help of a marine fleet. For decades he kept equipping ships which floated southward along the west coast of Africa and eventually turned eastwards, hoping to reach India. And though it was only the Gulf of Guinea, which was discovered instead of the Indian Ocean, natural resources of the new lands started to recover the costs of the expeditions.

A substantial advance of the Portuguese was colonization of the African Gold Coast (today's Ghana) which was captured in 1482. Natives (the Ashanti) who lived in the interfluvial area of the Volta and Tano extracted placer gold from sands in river valleys and manufactured genuine jewelry masterpieces (they were wonderful masters of such techniques as casting, filigree and embossing). The newcomers were interested in bar gold and hundreds of Ashanti cultural artefacts were remelted. A typical feature of gold 'mining' by colonizers was unscrupulous pillage of aborigines. During the first century of Portuguese ruling there were about 150 tons of gold obtained there, which made nearly 10% of the global gold production at the time. Later the country of Ashanti started mining of lode gold with the help of numerous shafts with a depth of up to 25 m. The ground surface dug over with such mines resembled honeycombs. It was the dependent indigenous population, who was used for mining.

King Juan II of Portugal set a task to the glorious navigator Bartolomeu Dias to go round the African continent from the south and find the way to India. His expedition left Lisbon in August 1487 and sailed round South Africa, entering the Indian Ocean for the first time. Although the ships' crew forced Dias to turn back to the motherland under the threat of revolt, the expedition proved the possibility of entering the Indian Ocean (on old Ptolemy maps used in the 15<sup>th</sup> century Africa stretched to the South Pole, which ruled out such possibility). With that in view, the Cape of Storms (the southern tip of Africa) discovered by Dias was renamed by King Juan II as the Cape of Good Hope i.e. a hope to reach India.

On 8 July 1497 almost the entire Lisbon bid farewell to their courageous heroes - the expedition of Vasco da Gama - setting out on a voyage to the coasts of India. It comprised four best ships of special design, which were equipped with the most advanced nautical instruments of the time, revised maps and update information about West Africa, India and the Indian Ocean. The elect 160 crew members were the cream of Portuguese sailing. On 20 May 1498 that expedition was destined to be the first to

reach mysterious and desired India by sea in the area of the port of Calicut. Engagement in the expedition of Ahmad ibn Majid, one of the best Arab pilots and cartographers, notably contributed to the above. They failed to establish friendly trade relations because Arab merchants who controlled local maritime commerce were extremely hostile towards the Europeans.

The second expedition of Vasco da Gama to India (1502-1503) was of outright military nature and had a program for seizure of territories, developed by King Manuel of Portugal. In the course of time Vasco da Gama was given the title of Viceroy of India and the Portuguese colonization expanded to a considerable part of the western coast. From 1510 the town of Goa controlled by the Portuguese became the main center for outflow of rough diamonds whereas Lisbon turned into the largest market for diamonds and other gems in Europe. Later on Portuguese colonizers got hold of a substantial part of diamond mining in the area of Golconda for some time. In the 17<sup>th</sup>-18<sup>th</sup> centuries some Dutch, French and English trading stations appeared alongside of the Portuguese ones, whereas after the victory of the British East India Company troops over the army of the Bengal ruler in the battle at Plassey (1757), England gradually seized the reins of power over the country with the richest deposits of semiprecious stones.

Up-to-date geographic knowledge acquired by Portugal in the late 15<sup>th</sup> century was kept strongly secret and for a long time remained unknown to the rest of European countries. The majority of seamen found it next to impossible to round Africa. Accordingly, they intended to reach the east coasts of India by heading westwards (it was an idea of Italian geographer and astronomer Paolo Toscanelli, based on the perception of the round shape of the Earth). That task became a dream and the basis for life of Christopher Columbus, an experienced navigator and inspired seeker of gold. He insistently offered his project to Genoa, Portugal, Spain and England, eventually managing to persuade the Spanish monarchs Ferdinand and Isabella.

During 1492-1504 Christopher Columbus undertook four search expeditions which discovered the New World, although the navigator himself considered for life that he had landed in East Asia - China or India. In 1493 Pope Alexander VI of Rome approved the world distribution of new territories to prevent disagreement between Castilla (Spain) and Portugal, which implied that all the lands 'discovered' or 'to be discovered' by Castilla westward of the 'Pope's meridian' running 370 miles to the west of the Cape Verde Islands (in the Western Hemisphere) would belong to Castilla whereas new lands discovered eastward of the Pope's meridian (mostly in the Eastern Hemisphere) would be owned by Portugal. Not diminishing the achievements of Portugal in Africa and Asia, it should be noted that it was innumerable mineral resources of America (primarily its precious metals), liberally delivered to Spain and distributed throughout Europe since the 16<sup>th</sup> century, which to a great extent governed step-wise changes of the economic, financial and social development of European community [7].

On 3 August 1492 Columbus brought three ships with a crew of 90 sailors out of the harbor of Spanish port Palos de la Frontera, crossed the Atlantic and on 12 October made a landing on the coast of an island which he named 'San Salvador' (Spanish: Holy Savior) and where he planted a Castilla flag. That was the beginning of discovery of the Bahama Islands and the Antilles and later (from 1502) the American mainland (so called 'terra firma').

The crew sent inland of Espanola (today's Island of

Haiti) to search for gold found rich deposits of placer gold in sands of the Cordillera Central mountainous area. That first gold field in the New World was discovered in January 1494. Columbus also reported that he had founded the first settlement in Espanola 'in the best place for gold mining'. Discovery of new lands was the beginning of a large-scale conquest (the so-called 'conquista') and feudal colonization of America by Spanish conquerors and settlers. Almost continuous wars for liberation of the south of Spain and North Africa from the Muslims lasted for several centuries and formed a glorious military medium of conquistadors, which was reinforced by Spanish gentry and numerous adventurers from different camps, managed in a short time to conquer the old-established American civilizations of the Aztecs, Mayas, Incas et al. and seize enormous treasures accumulated there within centuries. Evidence of the availability of gold in the lands of any particular tribe served a 'beacon' for choosing directions of military expansion.

It should be noted that gold and silver mining in pre-Columbian America started at least in the 2<sup>nd</sup> century of the Christian Era, the autochthonous civilizations extracting the resources in the context of quite harmonious social relations (without exploitative slavery). The main mining centers were concentrated in the territory of present-day Mexico, Central America, Colombia and Peru. The simplest mining tools made of stone and high-quality bronze were used (the Indians were not familiar with iron production). To break hard rock, a firing technique was employed. A bulk of gold was extracted from placers.

The Europeans began to extract gold in the New World initially on the Antilles, indigenous people showing the location of gold deposits themselves, never suspecting their future in the capacity of slave miners. From 1494 to 1520, about 22 tons of gold were extracted (mostly in Espanola - the Cordillera Central and Cibao deposits). Almost complete obliteration of the indigenous population was the price of that metal. The 16<sup>th</sup> century Spanish Chronicles bear evidence of the fact that over 80% of the Indian slaves perished as early as during the first year of work in gold fields. Further, large-scale engagement of menfolk in mining notably undermined the traditional economic structure of the Islands (gardening, hunting and fishing), which resulted in famine and propagation of diseases. In course of time mining conscription was also extended to the indigenous population of the continent, who had a rather developed civilization level, as opposed to the archaic inhabitants of the Islands.

Christian priests, among whom Bartolomé de Las Casas stood out owing to his uncompromising attitude, spoke out against inhuman crimes against the Indians. Having personally met the King of Spain, he never feared to forebode that terrible crimes of conquistadors against the Indians would result in 'divine retribution and disruption of Spain itself'. Owing to the efforts of the church, from 1512 there were King's laws issued, which aimed to stop high-handedness of colonizers in respect of the Indians and introduce a system for bureaucratic control over their exploitation scale. Those laws led to unexpected results of the continent colonization - bringing of numerous slaves from Africa. The resource development in America was therefore the primary cause of the most massive in human history forced relocation of peoples. That being said, cruel exploitation of the Indians, in violation of King's laws, persisted in the majority of territories, though in limited or latent forms.

The first inland colony of the Spaniards, which had an expressive name of 'Gold Castilla', appeared on the Caribbean coast of today's Colombia in the early 16<sup>th</sup>

century. Collisions with the warlike indigenous population were a constant threat to its existence and conquistador Vasco Nuñez de Balboa moved with some colonists to quieter regions of south-east Panama. It was there where he founded the first in America European town of Santa Maria de la Antigua. The main activity of its inhabitants was exchange of cheap welfare items and ornaments for precious metals of the Indians who had a great many of them. According to annalist Jeres, one of caciques (noble Indians) who had observed the attraction of white people to the yellow metal, which was beyond the scope of his mind, promised to show to the Spaniards a southern country where the immense amount of gold would satisfy every need for it. Balboa requested King Ferdinand to send a detachment of one thousand conquistadors for conquest of the 'gold country' but on 1 September 1513, having failed to wait for reinforcement (Spain fitted up twice as many warriors but made Pedro Arias de Avila, a King's confidant, their commander rather than Balboa), he departed with a team of 190 warriors and 600 Indians to seek gold.

The detachment crossed the mountains of the Isthmus of Panama and reached the coast of the Great Southern Sea (thus discovering the Pacific Ocean for the Europeans). The new lands named 'Peru' (word for word: 'I am flying' - the feeling that seized him atop of the mountain ridge) by Balboa, were proclaimed the property of the Spanish Crown.

Meanwhile, the other conquistador Hernan Cortes, assigned the captain of the third expedition to Mexico, made a landing on the Mexican coast (April 1519) and eventually sank the ships of his squadron, making the retreat of conquistadors impossible and establishing a new motherland for them, which yet had to be regained from the bellicose Aztecs. The conquest of the Aztec Empire and creation of New Spain on the Aztec lands had the character of an acute military confrontation where victory went over to Cortes largely owing to support of numerous Indian tribes which were at enmity with the Aztecs. Enormous riches seized (especially in the capital of Tenochtitlan, which at the conquest time was among the largest and richest towns in the world) were passed on to the Spanish King. Precious metals were accumulated during predatory plunders of the original Indian civilizations, all-round seizure of ceremonial attributes, decorations of palaces, temples and shrines as well as jewelry from the population. In length of time exploration of deposits commenced, the Indians or brought-in Africans employed in mining. That said, it is surprising that detachments comprising several hundreds of the Spaniards organized mining operations involving tens of thousands of slaves. The first professional colliers and gold miners arrived in Espanola together with Hernan Cortes in 1504, the majority of mine workings however remained for a long time at the level of direct production.

Yet in 1522, in a year after the downfall of the Aztec Empire, the Spaniards began to develop the complex deposits of Pachuca and Real del Monte near Mexico, which were rich in silver and gold. In 1543 an extremely high-grade ore district of Guanajuato was discovered, which is in the north-west, 400 km away from Mexico. During almost 400 years of exploitation of the Guanajuato mines there were 32 thousand tons of silver and 130 tons of gold extracted there.

In 1591 a large Mexican silver deposit of San Luis (Central Mexico) was discovered, which huge production allowed in as early as a few years to found one of the first American universities in the miners' town. The high-grade El Oro deposit (north-west Mexico) had been exploited since 1600, its production approximating 170 tons of gold.

The deposits and placers officially belonged to the Spanish Crown but in practice were owned by their discoverers who paid the fifth part of the production to the King's treasury. Such approach largely encouraged the search for and exploitation of new deposits. During the first years after the conquest of Mexico, pieces of silver, which corresponded by weight to Spanish coins, were in monetary circulation. The word 'weight' is translated into Spanish as 'peso'. That name was assigned to the monetary unit of Spain and Mexico and later in other Spanish colonies. In 1536 they started minting coins in Mexico. During 1536 and 1888, about 3 billions of silver Mexican pesos were stamped out at 11 Mexican mints, the bulk of which were used by European mints as the material for stamping out their own coins.

Spanish conquistadors gained even more in South America. In 1533 the conquistador Francisco Pizarro, following the trade of Vasco Nuñez de Balboa, conquered Peru and subjugated the Incan Empire capital of Cuzco. The Incan state which emerged in the 14<sup>th</sup> century and united the old civilizations of the Andes mountain belt, impressed with its majestic architectural monuments, cultural facilities, paved roads running for thousands of kilometers as well as a high level of gold smithcraft and abundance of valuable articles.

The Incas worshipped the Sun and built about 300 temples decorated with a great number of gems. All those wonderful works of art were eventually ransacked and mostly destroyed (remelted into ingots). In Cuzco alone the Spaniards seized huge spoils - about 1.1 t of gold and 15 t of silver. The notorious ransom received by conquistadors for Incan Emperor Atahualpa was 5.5 t of gold and 11.8 t of silver. A. Durer, a great German artist, who was lucky to examine the riches brought from America in the palace of Spanish viceroys of the Netherlands, indicated a high artistic level of those ornaments. There was a gold disk with a diameter of over 2.1 m among other things. *'Throughout my life I have never seen anything of the kind, which would please my heart in such a way'* Durer wrote.

Pedro Cieza de León in his fundamental 'Cronicas del Peru' (1553) pointed out that rich gold fields of the Indians were concentrated in the valley of Chuquiago, near Lake Titicaca. During several decades, thousands of small workings (stables and galleries) were driven under Spanish supervision in deep cloughs formed by Peruvian rivers, where precious metallic minerals were mined.

In the north of Peru of the time (today's territory of Colombia) the greatest success in exploration of deposits attended the expedition of Captain Jorge Robledo and Knight Commander Hernan Rodriguez de Sosa, who discovered a high-grade deposit of placer and lode gold in the upper reaches of the River Cauca Magdalena (190 km to the west of Bogota) in 1539. Its development laid the foundation for the well-known Columbian mines of Ancerma and Quimbaya. In the 16<sup>th</sup> century the Ancerma ore district alone produced 116.5 t of gold (about 18% of the global production). In the early 17<sup>th</sup> century gigantic primary gold deposit Titiribi (located 62 km southwest of the city of Medellin) was discovered, which secured the worldwide leadership of Colombia in gold extraction for more than two centuries. During 1600-1700 the Columbian mines extracted 318 t of gold (nearly 40% of the global production) and in the 18<sup>th</sup> century the country further strengthened its leadership. In general, Columbian mines produced over 50% of the total gold of Spanish America. In the first half of the 19<sup>th</sup> century there were depletion of Columbian deposits and a substantial decrease of production observed, when Colombia gave place to Brazil in the gold extraction (in 1824 one of the largest deposits

of South America, Morro Velho, was discovered in the Brazilian State of Minas Gerais (translated as 'General Mines'), which produced about 350 t of gold).

Insatiable greed of gold and a great loot taken away by conquistadors from the Indians gave rise to legends about the miraculous gold country of Eldorado *'where teeming treasures were as humdrum as an ordinary wild stone is here'*. The name of Eldorado is translated as *'gold man'* and is related to a custom of Chibcha Muisk tribes (south Colombia) to clay and dust the chief with gold prior to coronation. In the high mountain area of the Colombian Andes (south of Bogota), there is Lake Guatavita located in a dormant volcano crater, where the Indians performed a rite of initiation of a young chief to be a ruler. Once the chief had washed off the gold from his body in lake water, the Indians threw their gold adornments and ceremonial articles into water. Stories about sacrificing gold to Gods, which was thrown from balsa rafts into holy lake water, raised conquistadors' greed. The first expeditionary corps reached Guatavita in 1536 and only 170 conquistadors out of the assault party comprising thousand warriors came to the target, who plundered local Indians, having failed to lift the main treasures from the bottom of the lake.

The major country where silver deposits were concentrated was Peru of the day (today's Peru and Bolivia). In the 16<sup>th</sup> century some silver mines in Castrovirreyna (1555), Oruro (1595) and Cerro de Pasco (1630) were founded there. Cerro Rico de Potosi turned out however to be the largest deposit (1544). According to V. Vernadskyi, from the commissioning of the Bolivian Potosi goldfield the inflow of silver to Europe in 1546-1560 versus 1521-1545 increased tenfold. The overall silver production there for 300 hundred years of exploitation exceeded 35 thousand tons.

The first silver mines of Spanish conquistadors in Peru appeared in the early 1540s in the Incan development area - the Porco Mountain (the Province of Charcas, southwest of Bolivia), where the Silver township was founded. Historian Pedro Cieza de León in his 'Cronicas del Peru' (1553) described those events as follows: *'In that Porco Mountain which is near the Silver township there were mines where silver for rulers was extracted. They assert that a lot of silver from the Coricancha, a Temple of the Sun, was extracted in that particular mountain; the Spaniards also produced much silver. This year there has been a mine of Fernando Pizarro developed, which in a year will bring him a profit, worth of over 200 thousand pesos...'*

In the course of time the richest deposit of Cerro Rico de Potosi was discovered. According to 'Comentarios Reales de los Incas' (1609) by the Inca Garcilaso de la Vega, the Rich Mountain (Cerro Rico) was known yet to the eleventh ruler of the Incan Empire, Huayna Capac, who 'set out in 1462 to Porco and Andacahua, the rich mines where numerous arrobas (the measure of weight, about 10 kg) of silver were extracted'. On his way he saw a mountain (future Potosi) and, impressed by its beauty, told to his court nobility: *'This mountain has doubtlessly to have silver in its heart'* and ordered to bring tools there and start working. As legend has it, his servants did that and discovered some high-grade outcropping silver lodes but when they started working them, a thundering noise shook the mountain and a loud voice ordered: *'Don't take silver from this mountain. God protects it for those who will come later'*. The Incans came back to the King and told about that warning. Since then silver remained intact there whereas the mountain was named 'Potosi' ('potosi' means 'voice').

In 1544 the Indian shepherd Hualpa (Gualchi) showed

the outcrop of silver deposits. The official title of the 'discoverer and founder' of ever the richest silver mine went to the master of the Indian, conquistador Juan de Villarreal, who owing to that great finding was appointed the Viceroy of the New World. In 1545 Villarreal brought 170 Spanish settlers and 3 thousand Indians to the Rich Mountain and founded the town of Potosi. Owing to teeming treasures of the Silver Mountain, as early as in a quarter century the town population reached 120 thousand people and exceeded 180 thousand by the middle of the 17<sup>th</sup> century, which made over one third of the total European population of America of the day.

In the 17<sup>th</sup> century Potosi was the largest and most influential town of the New World, at which creative people of all Europe directed their eyes. The wealth of Potosi attracted the most famous architects, sculptors, artists, poets and men of faith. There were 86 churches there and many streets were genuine masterpieces of Spanish colonial architecture (the town is entered in the UNESCO List of World Cultural Heritage). Potosi's coat of arms was crested with the inscription 'Most Loyal Royal Town' ('Muy Leal Ciudad Real'). According to one lead, Potosi mint-mark (interlaced letters PTSI) became a prototype of the US Dollar. Potosi was located at a height of 4090 meters above sea level, which made it one of the extraordinary towns of the medieval world.

It was the Indians who mined and transported silver for a long time, which was their labor conscription (mita) introduced by colonizers. Initially they were demanded to only pay a specific measure of silver. The situation was radically changed in the late 16<sup>th</sup> century when miners who had come from Germany introduced the silver amalgamation and refining techniques. Knowledge and experience of the Indians were no more useful for the owners of mines and they began to use the autochthonous population mostly as slaves for hard mining works. The Potosi Mountain became a symbol of rich mineral resources of America and at the same time tragedy of its indigenous inhabitants. There was a catastrophic shortness of hands. Mine owners had a real hunt for the Indians throughout the continent. Head hunters brought ever new gangs of Indian slaves but the mortality at mines and processing plants was so high that nearly none survived till the end of the introduced five-year period of labor conscription (the majority of workers perished during the first year of labor duty). Particularly unbearable for the Indian heliolaters was the fact that they spent the rest of their lives in the mountain and could not see their deity. Deep under the ground, there were located not only working faces but also dwellings-prisons, hospitals and cemeteries of Indian miners.

Over 1545-1600 the total production of all European mines was only 1.9 thousand tons of silver whereas over 7 thousand tons of silver were dispatched from Peru (mainly Potosi) to Spanish Seville under convoy of ships of the glorious Silver Armada (according to historians, approximately the same quantity of metal was lost due to ship accidents and corsair assaults supported by covert efforts of England, France and the Netherlands).

During the first half of the 17<sup>th</sup> century about 15 thousand tons of silver were delivered to Spain from America, which resulted in downswing at many silver mining centers of Europe, unable to compete with rich overseas deposits in the context of the decrease in value of silver. It should be noted that intense development of mining in Spanish America regenerated the development of mercury mines in Almaden (Spain).

In his *Kleine Geschichte Südamerikas and Südamerika: Gesicht, Geist, Geschichte*, Ernst Samhaber

described the silver wave that rolled from the Andes throughout the world as follows: 'A silver stream shot a way out from Potosi and ran far beyond the ocean, to Spain which it filled with wealth and power. A happy epoch for the Spanish economy, art and science set in. The silver stream flew further from Spain and turned little Portugal into a world power ... But the silver stream never stopped there; it crossed the Pyrenees, spread over France... The silver stream also nurtured the world empire of Great Britain. Only those countries stayed off the road, which had been theretofore at the wheel of European history: Italy and Germany. The great historical development initiated by Potosi passed over them'.

It is not worth thinking that flows of American gold and silver brought only prosperity and welfare to Spain. The inflow of a great quantity of money metals undermined effective economic laws and political equilibria. After a while, Spain, apotheosized and exalted to power, found itself in chaos of inflation and economic stagnation. Production development incentives vanished whereas huge resources were used to buy luxury goods and waging of numerous wars. With time, the term of 'Spanish ailment' was offered in economics, which interprets the wealth of mineral resources as a curse for economic development of a country. For all that, Potosi's silver was among the most effective levers in tectonic shifts of history, which governed the replacement of medieval relations with New time.

### Conclusions

1. The development of European civilization of the late Middle Ages was to a great extent determined by discoveries of rich gold and silver deposits in South America, which had a significant impact on world trade and capital accumulation in Europe. Mining colonization of the Aztec and Incan Empire as well as Peruvian gold, silver and mercury deposits were substantial steps on that way.

2. Mining engineering at fled developments of the New World was at a low level for a long time, which was related with use of hand labor of thousands of Indian and African slaves. The first professional miners together with H. Cortes arrived in the New World in 1504 but it had no radical influence on mining equipment and technology in America.

3. Colonization as well as mining and industrial development of African and American territories discovered by the Europeans determined the century-long geography of the main developments of the world amplest mineral resources.

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### **ГОРНАЯ СОСТАВЛЯЮЩАЯ ЭПОХИ ВЕЛИКИХ ГЕОГРАФИЧЕСКИХ ОТКРЫТИЙ**

В статье анализируются основные двигатели эпохи Великих географических открытий, в частности стремление к драгоценным металлам Нового мира; систематизирован исторический обзор освоения минеральных сокровищ испанской Америки, рассмотрены основные очаги добычи золота и серебра, показана роль конкистадоров в организации горных работ и судьба автохтонного населения, вынужденного работать в многочисленных рудниках, оценено значение минеральных ресурсов Нового мира для становления мировой финансовой системы и международной торговли XVI - XVII в.

*Ключевые слова:* географические открытия; минеральные ресурсы; история горного дела; конкистадоры; эльдорадо; горная колонизация территорий; освоение недр; горняки-невольники; международная торговля; "испанский недуг".

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### **MINING CONSTITUENT OF THE PERIOD OF GREAT GEOGRAPHIC DISCOVERIES**

The paper reviews the major drives of the period of great geographic discoveries, specifically aspiration for precious metals of the New World; systematizes the historical background of acquisition of the mineral wealth of Spanish America; examines the main gold and silver mining centers; shows the role of conquistadors in mining management and the share of autochthonous population who had to work in numerous mines; evaluates the significance of mineral resources of the New World for the buildup of the world financial system and international commerce in the 16<sup>th</sup> - 17<sup>th</sup> centuries. Important steps on that way were the mining colonization of the Aztec and Inca Empire by the Europeans, Peruvian gold, silver and mercury deposits.

It is concluded that the colonization as well as mining and industrial development of African and American territories discovered by the Europeans determined the long-term geography of the main developments of the world amplest mineral resources.

*Key words:* geographic discoveries; mineral resources; mining history; conquistadors; El Dorado; mining colonization of territories; resources development; miners-slaves; international commerce; 'Spanish ailment'.

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Надійшла до редакції 10.03.2015