

MINING AND ITS SIGNIFICANCE IN THE FRAMEWORK OF THE GREAT CULTURAL ROUTES, WITH A SPECIAL REFERENCE TO THE SPANISH ROYAL ROAD (“EL CAMINO REAL”)

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Introduction

Mining has been the driving force for the settlement of populations and the creation of historic infrastructures and superstructures, giving rise through the flow of individuals and goods, to great cultural exchanges in the history of mankind. The Royal Road which grew up around the exploitation of precious metals in America is perhaps the most important example of this. However, in contrast with other types of heritage sites, the concern for the conservation of mining heritage has been quite recent. In fact, the World Heritage List contains only a few elements of this type¹. On the other hand, from a social standpoint, the mining crisis is offering few possibilities to those townships located in the areas of influence of the mining industry, generally heavily dependent on this activity and which might find relief through the correct conservation and exploitation of this resource for tourism purposes.

Aware of this concern, the International Scientific Committee for Cultural Itineraries and ICOMOS, with the collaboration of the UNESCO ICOMOS Heritage Chair (Spain) at the Polytechnic University in Madrid, have been working on this subject within the field of Spain's mining heritage, with the support of the Spanish Ministry of Culture.

Historic mining in Spain can be formally set out in two large periods, leaving aside the industrial era.

Pre-Colombian era

¹ The Neolithic flint mines at Spipenes in Mons, Mines of Rammelsberg and Historic Town of Goslar, Historic Town of Guanajuato and Adjacent Mines, Wieliczka Salt Mine, Las Médulas, Mining Area of the Great Copper Mountain in Falun. Related sites are the City of Potosí, Ouro Preto (Black Gold), Historic Centre of the Town of Diamantina, Historic Centre of the Town of Goiás, Historic Centre of Zacatecas

The oldest mining activities linked to metal extraction are in the south west (copper and precious metals in Huelva) and in the south east (silver in Almería, during the third millennium BC. The mining engineer Meseguer Pardo attributes the instruments and human remains discovered in the copper mines of Aramo (Asturias), Cerro Muriano (Cordoba) and Riotinto (Huelva) to the Cro-Magnon and Furgu cultures.

Subsequently, symbiosis is established between the Tartessians, as the miners, and Phoenicians, as the traders, for the precious metals, copper and tin from the Pyritic Belt in the south west of the Peninsula, whereas the Hellenes were attracted by the mineral wealth of the south east, with both cultures reaching the deposits at Cerro Muriano, in Cordoba.

The Carthaginians exploited the iron and silver from Cordoba and Jaén for their military campaigns, while Spanish mining attained its maximum splendour during the Roman period when it spread throughout the Peninsula and considerable technological and cultural activities focused on mining. Although Las Médulas or the Pyritic Belt were the most important mining centres, there is practically no gold or silver deposit in Spain that was not mined by the Romans. Mining in the Cerro Muriano takes its name from Sextus Marius, the owner of the mines, and the tunnels dug to extract the metals used lagging systems similar to those in existence at the beginning of the 20th century and numerous civil engineering works were built such as dams, contention walls, vaults, etc. The first legislation on mining issues dates from this period.

After the fall of the Roman Empire, mining activity declines as the cultural focus shifts to the Arab world, mainly agricultural, with the Mine at Almadén being operated almost exclusively thanks to its extraordinary richness. The name of Almadén comes from the Arabs (al-ma daniy yun, “the mine” or the “mineral”) and, according to the historian Al-Edrisi, this is where *over a thousand workers were employed in the mines to dig out the mercury and send it all over the world.*

Colombian era of Spanish mining

After the discovery of America, and with the impoverishment of mining in Spain after the granting of feudal deeds in the Middle Ages, the centre of interest for Spanish mining moved to the New World. The Royal Road which linked all the new territories with their peninsular homeland was designed, especially at the beginning, following the routes used to search for and exploit the precious metals from America. The drive to discover these valuable minerals led to such legends as the Myth of El Dorado which helped drive forward the exploration of new lands. These myths were even the reason for some idealistic toponyms such as the Río de la Plata (Silver River).

In order to extract the precious metals by means of amalgamation, the mercury from Almadén was used after being transported to America together with the necessary tools and instruments for mining. This mining traffic led to the development of one of the most important cultural itineraries that have ever existed in the history of mankind, extending not only from Spain to America but also with trade and cultural traffic in Asia through the galleons of Manila.

Almadén, the mercury route and the Royal Road

With a total mercury production that is two and a half times greater than the second largest mine in the world (Idria in Slovenia) and almost four times greater than mine number three (Monte Amiata in Italia,) the deposit at Almadén is a unique phenomenon in the processes for generating minerals. Almadén has produced one third of all the mercury ever used by mankind.

Almadén's cinnabar (mercury sulphide) was used by the Romans as a cosmetic, whereas raw mercury (hydrargyrum) had no application as it was already known to be poisonous. Vermilion (massing cinnabar) was used mainly as a pigment with which they adorned the statue of Jupiter, as well as the bodies of the gelded bulls in the circus and the faces of Roman matrons. References to the cinnabar from Almadén can be found in the texts of Theophrastus, Pliny the Elder and Vitruvius².

² According to Escosura y Morrogh (Historia del tratamiento metalúrgico del azogue en España, Madrid, Imp. M. Tllo 1878)
Pliny the Elder. Naturalis Historiae, Liber XXXIII, Chap. VII
Vitruvius, The Ten Books of Architecture. Liber VII, Chap. XIX

The distillation of cinnabar to produce quicksilver occurred with the Arabs, using "xabeca" furnaces for the purpose to produce a medicinal and cosmetic product ("soliman"), but it is not until the discovery of America that Almadén acquires its true significance within the history of the world.

The Royal Road was laid out along the trade routes of the quicksilver needed to amalgamate the precious metals in America, using the method called "Beneficio de Canoas" (Canoe beneficiation) after the Mexican term used to describe the large boxes used to make the amalgam, developed by Bartolomé de Medina in New Spain in 1554. This method, used in mercury-based extraction for three centuries, required the crushing of the ore to a fine powder called "arina" that was then left for a long time in contact with the mercury, salt and "magistral" (probably roasted pyrite that provided the acid to break down the silver minerals). Bartolomé de Medina's discovery was especially important in the abundant silver mines of Mexico, where lumber was too scarce to be able to extract the silver by roasting and the ores were poor.

At the time Almadén enjoyed an extraordinary period of splendour, with the mining operations being rationalized and with the building of the first hospital for miners, the world's fourth mining school, the second bull ring, and different technologies were perfected for the extraction of mercury from cinnabar.

Because of the strong demand for the liquid metal, quicksilver deposits were identified at Huancavelica in Peru (1563), which went mostly for internal demand and provided mercury to New Spain only when Almadén was unable to do so. It was in this mining town that the "Aludel" or "Bustamante" furnaces were developed for the distillation of mercury and its technology was later taken to Almadén.

The transport of mercury to America involved several routes in its maritime leg, the most important of which was the one from San Lúcar de Barrameda to Veracruz, which represented between 1614 and 1630 an annual mean transport of about 4,000 *quintales* (\pm 200 tonnes) of quicksilver. This route covered 9,000 Km, during which the quicksilver changed its packaging at least twice and was transferred from one means of transport to another no less than three times.

Inside the Iberian Peninsula, the first stage of the route was the 186 km from Almadén to Seville, a distance covered in a month. In the Cerco de Butrones, in Almadén, the mercury was packed into leather bags slung on ceramic containers to facilitate pouring after weighing. Transport

was by ox-cart or mule trains, depending on the time of year and the state of the roads. Along the way, freight transport from Almadén had certain privileges, such as exemption from tolls and gate charges, provision of pastures and the impounding of utensils needed for its progress.

The two routes reached Santa Eufemia, in Cordoba and on to Azuaga in Badajoz, where they divided. From here, one of the trails led through Llerena, Santa Olalla, El Ronquillo and Castilblanco de los Arroyos to Alcalá del Río. The Guadalquivir had no reliable fords downstream from the Roman bridge at Cordoba, so it was necessary to resort to the services of barges before entering Seville across the, at the time unstable, bridge of Triana.

The other trail came through Malcocinado, Alanís and Constantina, approached the Guadalquivir at Lora del Río, before coming to Tocina, where there was a barge service, then continued through Brenes to Seville.

In the summer, when mules were used, there was a third possibility, a shorter and steeper route from Azuaga through Alanís, Cazalla de la Sierra and El Pedroso to Cantillana, where the river was crossed on barges before continuing towards Brenes and Seville.

The territory crossed represented a blank spot with respect to road networks, nonetheless it was chosen over the Royal Road connecting Toledo with Seville through Malagón, Ciudad Real and Almodóvar del Campo (until the Despeñaperros Gorge was opened up) and running about 60 Km from Almadén. The route chosen crossed the quartz alignments of the Hesperian Massif and the river beds constrained by these alignments, narrow gullies that were difficult to negotiate, so the paths tended to follow the interflaves. However, the westernmost route coincided after Monasterio with the old Roman road of the Silver Route linking Astorga (Urbs Magnifica) and Hispalis (Seville) through Emerita Augusta (Mérida), while the eastern road coincided with the Route of the Caliphs, joining Cordoba to Seville after Lora del Río, crossing the Guadalquivir either at Lora itself or at Tocina. Once in Seville, the quicksilver was weighed again and re-packed at the “Casa de las Atarazanas Alfonsíes”, where it was stored until, in due course, it was shipped in shallow boats down to San Lúcar de Barrameda (or Cadiz after 1717).

Transportation to the Americas was in vessels such as the Nao Guadalupe. Normally, Sailings to the Indies set out in April, but the irregularity of the system meant it was necessary to resort to the alternative service of the so-called “navíos de aviso” (mail ships), which travelled alone with little protection and sent the cost of freight rocketing. It must

be remembered, however, just how significant for the plans of the Crown was any stoppage in the production of precious metals in America.

Once in Veracruz, carts could only be used on some parts of the road to the capital of the viceroyalty, so mule trains had to be used for most of the journey. The paths made before Columbus’s time had been designed for foot travellers as beasts of burden were only introduced into America by Europeans. The distance to be covered was 80 leagues (one league was equivalent to 4.000 or 5.600 metres), with a difference in altitude of 2.250 metres and the mule trains took about 25 days each way. This part of the Royal Road was also the Atlantic route for the penetration of trade in general, as well as for religious, cultural and military influences.

At the capital, the liquid metal was stored for later distribution to the mining centres. The main route was along the Inland Royal Road (Camino Real de Tierra Adentro), established in the middle of the 16th century, all the way to Zacatecas and further north to other mines as they were discovered, to Santa Fe de Nuevo México about 500 leagues from the city.

After various periods of splendour and decline, the truth is that Almadén has slumped into total inactivity in practical terms, following the sharp fall in the demand for mercury since the 1960s.

Singularity, integrity and authenticity of the mining heritage of Almadén

Few mining events in the world combine the characteristics of uniqueness, integrity and authenticity of Almadén. Whether it is considered as natural phenomenon or a cultural event, the significance of Almadén is of unrivalled importance. This uniqueness is reinforced by the scantness of the elements related with mining activities internationally recognized on the World Heritage List.

The history of Almadén, both the town and the mine, is reflected in both, documents and in numerous remains, mining instruments and metalworking devices, all conserved as a result of its geographical isolation and its almost exclusive dedication to mining, which has protected its heritage against the sequelae characteristic of towns with a strong urban development.

The Mine itself illustrates, at its different levels, how the exploitation of the minerals in the subsoil has evolved, with the ones nearest the surface being the oldest. Nowadays, the

tunnels and winches of the 18th century are being recovered, with favourable characteristics for their conservation, due to its low flooding that only affects at the moment the deepest, most recent levels of less historic value.

Furthermore, in Almadén there are various buildings and elements linked to mercury mining in various stages of conservation. The town itself has grown around the mine and forms part of the mining heritage as it has been affected very little by urban development. These unique elements include, among others, the hexagonal Bull Ring finished in 1765 to finance the Miners' Hospital (1752), the first to treat "el mal del azogue" (the quicksilver ailment), various winches, the Door of King Charles IV (1795), giving access to the Cerco de Butrones, where the metallurgical processes are carried out, the Aludel or Bustamante Furnaces to distil the mercury following the procedure developed by Lope Saavedra Barba, a doctor in Huancavelica (Peru), the façade of the Ancient Mining School (1782), the fourth of its kind anywhere in the world following the model of the one in Freiberg, the ruins of Retamar Castle (built by the Arabs and enlarged in 1467 by the Order of Calatrava), the Forced Labour Tunnel, which communicated the old Gaol with the Mine so that the prisoners could go to work in their underground caves, etc.

On the other hand, a series of cultural manifestations have arisen around the mining activity to create a cultural landscape comprising not only the Mine of Almadén itself but also the town and even related elements in the surroundings, as well as other nearby mining villages such as Almadenejos, other mines such as Las Cuevas or El Entredicho, and ethnographic and natural heritage that are all elements complementing, explaining and forming a single unit with the mineral deposit. Both the town of Almadén and the other mining villages in its context should have adequate protection measures to prevent the repetition of such acts as the destruction of the Gaol and the construction of buildings totally out of harmony with the setting such as the one housing the Polytechnic University School.

References

Abstract

The necessity of mining metals and other minerals for different purposes, including trade, has constituted the real motor for a great number of historic movements which have produced considerable social and economical development and changes, migratory flows, new local foundations and reciprocal influences over different periods of the history of mankind. In the ancient world, the gold, tin and copper mines of the Iberian Peninsula attracted people from the ancient Tarshish, as well as Phoenicians, Hellenes and Romans who established different settlements in its territory, while at the same time the Carthaginians, more bellicose, exploited the iron. All of them left their characteristic mark on the local culture and also received its influences. But the most significant event from a historic point of view took place after the discovery of America. The search for precious and valuable metals, the so-called “El Dorado Myth” produced an explosion of dynamic rush which gave way to an extraordinary amount of expeditions to explore the New World. The discovery of silver and gold mines in New Spain (today Mexico) and Peru determined the establishment of the Royal Road (the “Camino Real”), as the official way of communication for the transport of the tools, materials and instruments which were necessary for the construction of the mining structures, as well as a means for sending back to Europe the rich minerals obtained. In this way, the Camino Real became the arterial system on which were based communications as well as the administrative organisation and the control of territory within the huge Spanish Empire. Even though some cultural properties of this important Cultural Route which was created on the basis of the mining interests have already been inscribed on the World Heritage List, a common approach to their historic origins and related significance as a whole is necessary in order to understand correctly their full meaning and to provide for their most adequate management.

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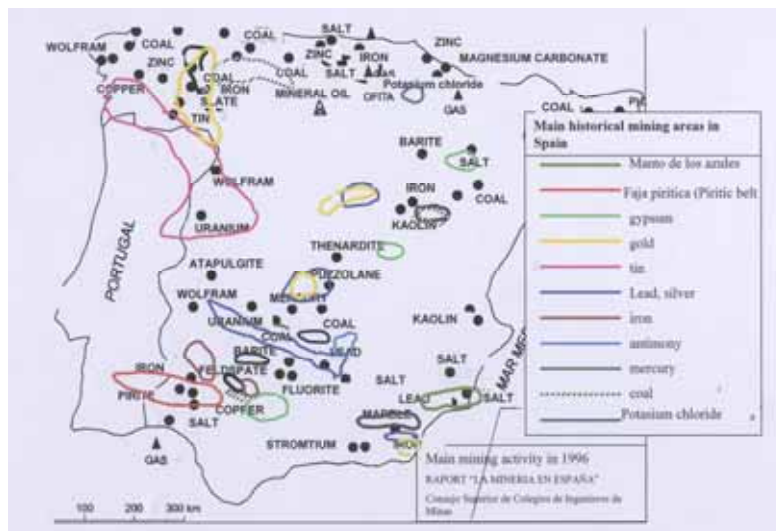


Fig 1. Mining in Spain

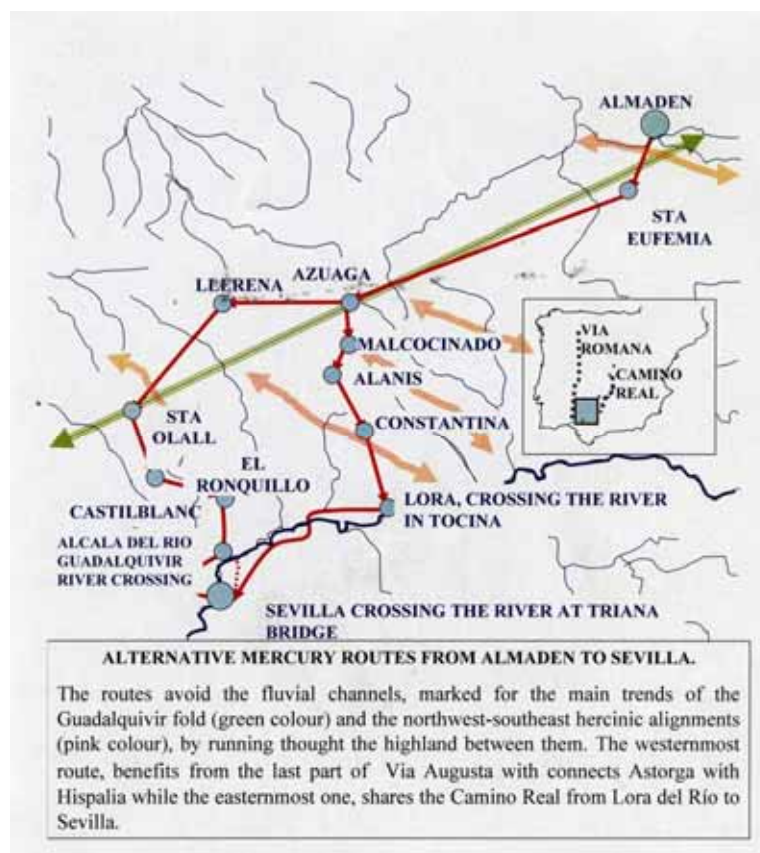


Fig 2. Alternative routes for mercury in Spain



Fig 3 Silver Routes following the Royal Road in Mexico.

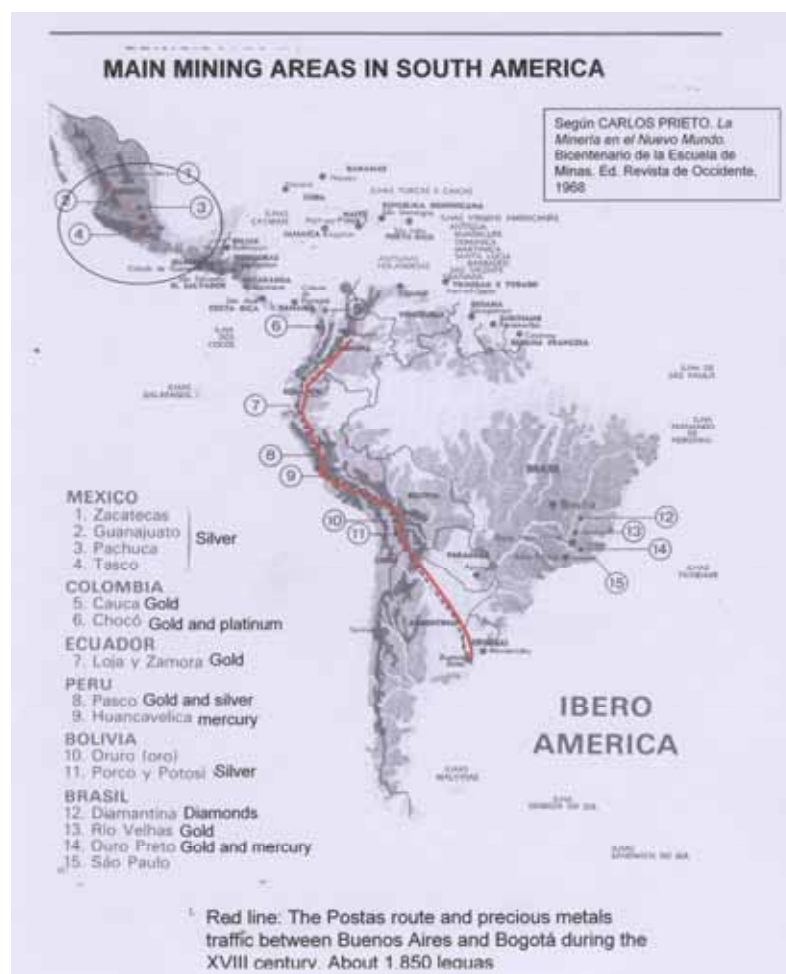


Fig 4. Mining routes in South America according to Carlos Prieto, La Minería en el Nuevo Mundo, Bicentenario de la Escuela de Minas, Rev. Occidente, 1968



Fig 5
Amalgamation Patio at Proaño Treasury for beneficiation of the Fresnillo silver mines (Zacatecas, Mexico). Oil painting by Gualdí, Museo Nacional de Chapultepec according to Carlos Prieto, *La Minería en el Nuevo Mundo, Bicentenario de la Escuela de Minas*, Rev. Occidente, 1968

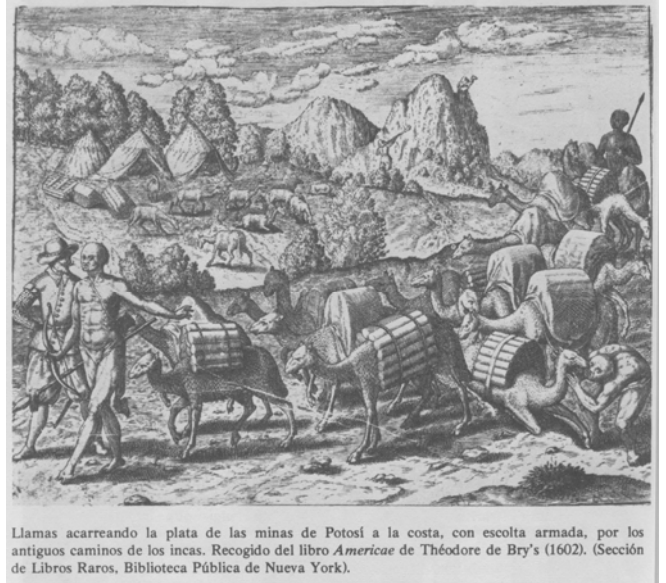


Fig 6
Llamas carrying silver from the Mines at Potosí to the coast with an armed escort along the old roads of the Incas. *Americae* by Theodore de Bry (1602). Rare Books Section. New York Library. Listed by Carlos Prieto, *La Minería en el Nuevo Mundo, Bicentenario de la Escuela de Minas*, Rev. Occidente, 1968



Fig 7
18th century lithograph in the tunnels of the Almadén Mine.



Fig 8
Aludel or Bustamante furnaces on display in Almadén



Fig 9
The King Charles IV Door, under restoration, giving access to Butrones Patio



Fig 11
Drainage tunnel from the gaol.



Fig 10
17th century tunnel, lined in brick and deformed by the pressure of the land.



Fig 12
Bull ring in Almadén with a hexagonal design, the second built after the one in Almuradiel.



Fig. 13
Gaol before its demolition.