

Anniversaries

Emerald mining in Egypt 700 years ago



EMERALD MINES IN UPPER EGYPT IN THE ISLAMIC PERIOD (UNTIL THE 14TH CENTURY): A NEGLECTED ERA IN MODERN HISTORY OF MINING

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Various heritage sources confirm that mines were widespread in all parts of the Islamic world, which reveals the prominent position that minerals occupied, as an aspect of the Islamic civilizational contribution on an industrial level.

However, many contemporary studies focused on emerald mining history, ignore the Arab-Islamic experience in this field. Giuliani confirms, in research and studies published, with others from 1998, that emerald was mined in Egypt by the Pharaohs between 3000 BC and 1500 BC¹. This mining activity continued during the Gallo-Roman period², and then stopped before the Islamic period. This was confirmed by the survey of Heuzé (2000), that summarized most works that dealt with studies of emeralds³.

Emerald is considered as one of the precious jewellery and high-ranking gemstones, appreciated by kings, sultans, rulers, and princes, who were keen to acquire it for adorning themselves. Emerald is formed of beryllium aluminum silicate, a transparent, colorless mineral when completely pure.



Photo 1: Emeralds, Muzo Mine, Vasquez-Yacopí Mining District, Colombia.
[https://en.wikipedia.org/wiki/Colombian_emeralds#/media/File:B%C3%A9ryl_var._%C3%A9meraude_sur_gangue_\(Muzo_Mine_Boyaca_-_Colombie\)_-2.jpg](https://en.wikipedia.org/wiki/Colombian_emeralds#/media/File:B%C3%A9ryl_var._%C3%A9meraude_sur_gangue_(Muzo_Mine_Boyaca_-_Colombie)_-2.jpg)

Referring to studies over the last three decades, related to tracing the sources of ancient emerald jewellery pieces of exceptional quality, the exploitation of emerald mines can be divided into three historical stages as follows: The first stage, from ancient times to the Spanish renewal of Colombian mines in the 16th century; the second stage, from the 16th century to the end of the 19th century, during which the Spanish exploited the Chivor mine (from 1545 AD) and the Muzo mine (from 1594 AD); the final stage, dating from the beginning of the 20th century AD, when the most emerald is currently extracted. Emerald extraction from the mines of Upper Egypt began at the least in the 3rd century BC. Egyptian emeralds continued to feed demand from Europe, the Near East, and India until the 13th century AD, when the resources of Egypt's mines became exhausted⁴. Excavations conducted on the monuments of most major ancient civilizations have revealed the presence of jewellery and items adorned with emeralds. Heuzé (2000) pointed out that the history of ancient jewellery is mostly unknown and that historical writings specifying the locations of emerald mines are rare⁵.

Researchers have developed a method based on measuring the percentage of radioactive oxygen to determine the location of current emerald mines and identify ancient emerald mines in particular, especially those dating to before the 13th century AD mentioned in the historical texts of Greek philosopher Theophrastus (372 BC-277 BC) and the Roman Pliny the Elder (23-79)⁶.

Al-Masoudi (896–956) mentions that the emerald stone was found in the area of Upper Egypt in the districts of Qift city, where it was extracted by digging. Four types of emerald were extracted here, varying in quality and price. They were arranged according to degree of quality in a descending order as follows: The first type, the bitter emerald, being an intense green colour and very transparent, neither blurred nor black; The second, called marine, its greenness being similar to that of the first type; The third, referred to as Moroccan and the fourth type, called the deaf, is slightly transparent and greener in colour⁷. These four types are consistent with the types of beryl that are classified today among the highest ranked gemstones, which are: Green beryl (Emerald) (Photo 1); Blue beryl (Aquamarine) (Photo 2); and the golden and scarlet beryl (Morganite) (Photo 3).



Photo 2: Aquamarine on Muscovite, Nagar Hunza Valley, Pakistan

https://en.wikipedia.org/wiki/Aquamarine_%28gem%29#/media/File:Aquamarine_P1000141.JPG.



Photo 3: Morganite, Blue Lady Mine. San Diego County, California, USA.

<https://fr.wikipedia.org/wiki/Morganite#/media/Fichier:Beryl-ck26a.jpg>.

Al-Biruni (973–1048) confirmed that emeralds were found only in Egypt and Upper Egypt, as the places of their extraction do not exceed “the borders of Egypt, the oases, Mount Mokattam, and the land of Beja.”⁸. Al-Jahiz (776-868) stated, that according to Al-Maqrizi (1364-1442), emerald mines were limited to Upper Egypt and were not found anywhere else in

the world⁹. Al-Idrisi (1100–1165) stated that the source of emerald was in a mountain south of Aswan, and it was not found in any other place all over the Earth, except what was in the mines of that mountain¹⁰ and what was in one of the mountains of the Ranj Island, an Indian island located in the tenth part of the first Province¹¹ (Probably the islands located today in Indian Ocean in front of Phuket). Al-Zuhri (died between 1154 and 1161) also pointed out the presence of the most expensive and finest emerald stones in the Aswan Mountains¹².

This demonstrates the level of knowledge that writers from different parts of the Muslim world: Al-Biruni, Al-Jahiz, Al-Masoudi, Al-Idrisi, Al-Zuhri and others, had with regard to the worldwide sources of emerald known in their times, as most emeralds were extracted from Egypt and from Indo-Iranian regions represented today by Afghanistan and Pakistan¹³. Giuliani et al. (2000c) point out that the mines of Upper Egypt and the mines of Austria remained the only sources of emerald in the Ancient World until 1545 AD, when the Spanish discovered emerald mines in the New World in Colombia (Latin America) and began exploiting them. As for Asian emerald mines, they were not officially discovered until the twentieth century AD¹⁴.

Regarding the emerald mines located in the areas of Qift and Qus in Upper Egypt, Al-Maqrizi (1364–1442) mentions very important indications related to the following¹⁵:

- ***The location of the mine***: He determined the location of the mine, in one of the lands of the Bugja tribe, on the land connected to Aswan, east of the Nile, on the highest mountain in the region, an eight-day moderate walk from the city of Qus;

- ***The organization of work in the mine***: This mine had an office, books, witnesses, and writers who recorded certain information and data related to the mine. It was also a mine guarded by the Bugja tribe, that lived around it and guarded and protected it from any dangers that could have threatened it from outside. There were also guards, tasked with monitoring the workers and inspecting them daily when they left the mine after they finished working inside it, under strict supervision, so that they were not able to steal anything that they extracted within the mine.

- ***The economic management of the mine and the emerald trading center***: The text gives an account of how a portion of the financial return was spent on the workers used to extract the metal from the mine, in order to secure their supplies. He also pointed out that the minerals extracted were transported to the city of Fustat, the world trade center, from which emeralds were then exported to other countries.

- ***The description of the rocks that contain it***: They were three types of white rocks;

- ***The treatment of the good type of emerald***: it was thrown into hot oil after extraction, then placed in cotton and squeezed;

- ***Historical information***: This mine was under state control and work there ceased during the reign of King Al-Nasser Hassan bin Qalawun (1334–1361). It was closed in the second half of the fourteenth century AD (About 1364 AD), by order of the Mamluk Minister Al-sahib Alam Al-Din Abdullah bin Zanbour.

Mining experience in extracting emeralds (Emerald indicators)

Al-Tifashi (1184–1253) mentioned valuable information related to the herald signs or indicators of the presence of emerald. He referred to mining indicators such as the biotite schists (the first indicator) and brittle talc rocks (the second indicator), that Al-Tifashi transmitted from an emerald expert miner¹⁶. This text represented an accurate description that is consistent with modern geological data, which indicate that emeralds are found in calcareous rocks (Micaschists), some of which are fragile and easily crumble containing pieces of emerald, and that large, good, fully developed pieces exist in the veins of quartz, embedded in biotite schists (Photo 4), or in phlogopite schists (Photo 5), or in the veins of the phenocrystals in pegmatites, which traverse the biotite schists. The emerald is concentrated in the contact areas between the biotite schists and the pegmatite veins that cut across it¹⁷.



Photo 4: Emerald and quartz, Carnaiba Mine District, Pindobaçu, Campo Formoso ultramafic complex, Bahia, Brazil
<https://www.flickr.com/photos/42200412@N03/46015736315>.



Photo 5: Emerald in Phlogopite Schist (rare, Spain)
<https://www.mineralauctions.com/items/emerald-in-phlogopite-schist-rare-spain-orellana-coll-63378>.

Al-Maqrizi's (1364–1442) text about the emerald mines in the Qift and Qus district confirmed that emeralds were found in veins embedded within muscovite schists¹⁸. It has been recently shown that the emerald sample MNHN No. 121–62, extracted in the nineteenth century from the Zebara mountain region, and given by Mohammad Koenig Bey (Said-Pacha) former secretary of the command of the Viceroy of Egypt (1862), was embedded within a quartz vein that cuts through muscovite schists¹⁹. Al-Maqrizi (1364–1442) confirmed in another paragraph that the emerald is enveloped by a membrane consisting of rocks that are different from it, in their colors and nature²⁰. Al-Dimashqi (1256–1327) described the membrane surrounding some types of emeralds as being similar to white salt. He also stipulated that emeralds are types that differ according to their colors, the nature of their greenness, and the degree of their transparency, and that some are surrounded by a membrane and some have successive layers of varying colors²¹.

This is in general agreement with the results of Grundmann and Morteani's (2008) study, on the emeralds of the regions of Zabarah mountain, Wadi Sikait and Umm kabo, in Upper Egypt (south of the Egyptian Eastern Desert), which concluded that it is possible to distinguish between three generations of emeralds²²: weakly colored emeralds found as single or nucleated crystals (cores) surrounded by two rims of light to very green emerald; Light green single emerald, homogeneous crystals or as a rim surrounding a weakly colored emerald, as well as a light green inner rim with a weakly colored core in the middle and a very green outer rim; And green to very green emeralds that appear as single crystals without zoning or as an outer rim surrounding a weakly colored core of the first type of emerald.

Such a discussion about determining the locations of the emerald mineral, mentioning its various types, methods of exploring and extracting it, describing the rocks adjacent to it or containing it, and how to treat it..., clearly indicated the high level of experience in exploring and extracting emerald, that had been acquired by gem prospectors in Egypt over many centuries. This Egyptian experience continued and had been developed in the Islamic era up to the 14th century, during which time Egypt represented the most important source of emeralds on a global scale - may be its only source -; Until the Sultan ordered the closure of these emerald mines.

Detailed study of the history of mining in Islamic countries is still lacking²³, especially with regard to the transfer of mining knowledge from Muslim countries to Europe. Information related to the extraction of minerals in Europe at the beginning of the Middle Ages was very

rare. Some historians of science believe that Ibn Sina's observations in the 11th century regarding minerals, their nature, types and properties, contributed to the development of the modern mining industry. Indeed, according to Mohammad Souissi (the veteran of Maghreb historians of science, who died in 2007), the mining methods and techniques used by the Andalusians in the city of Almaden, inspired German engineers to discover a metal, probably aluminium, which they used in aircraft manufacturing before World War II²⁴. It is worth pointing out that laboratory experiments with minerals (in the Muslim world from the 8th century), reached a degree of expertise that made it possible to produce certain gemstones in the laboratory: Al-Tifashi (1184–1253) described an experiment with which azurite was made.²⁵

¹ Giuliani G, Chaussidon M, Schubnel H-J, et al. Historique des gisements d'émeraude et identification des émeraudes anciennes (1ère partie) [Internet]. 2000a [cited 03 Apl 22]. Available from: <http://www.cprg.cnrs-nancy.fr/Science/Emeraudes/AFG1.html>; Giuliani G, Heuzé M, Chaussidon M. La route des émeraudes anciennes. Pour La Science. 2000d;277: 58-65. Pp: 60-61.

² Giuliani G, Chaussidon M, France-Lanord C, et al. *L'exploitation des mines d'émeraude d'Autriche et de la Haute-Egypte à l'époque Gallo-Romaine: mythe ou réalité?*. Revue de Gemmologie A.F.G. 2007;143: 20-24.

³ Heuzé M. Le jardin secret des Emeraudes. L'Objet d'Art. 2000;345: 52-65.

⁴ Giuliani G, Heuzé M, Chaussidon M. La route des émeraudes anciennes. Pp: 60-61.

⁵ Heuzé M. Le jardin secret des Emeraudes.

⁶ Giuliani G, Chaussidon M, Schubnel H-J, & al. Oxygen Isotopes and Emerald trade routes since antiquity. Science. 2000c;287(5453): 631-633.

⁷ Al-Mas'oudi, A. Muruj ad-dahab wa m'adin al-jawhar or *Gold Meadows and gem mines*. 1st eds. Beirut. Dar Al-Ma'rifa. 2005. Vol : 1. Pp: 20-22.

⁸ Al-Biruni, M. Al-jamaher fi ma'rifat al-jawaher or *The masses in knowing gems*. 1st eds. Beirut. Dar Al-Kutub Al-Ilmiyyah. 2010. P: 172.

⁹ Al-Maqrizi, A. Al-mawa'dh wa Al-i'tibar bi dhikr al-khitat wa al-athar or *Sermons and consideration by mentioning plans and monuments*. 1st eds. Cairo. Library of Religious Culture. vol: 1. P: 194.

¹⁰ Al-Idrisi, M. Nuzhat al-Mushtaq fi Khtiraqi Al-afaq or *Al-Mushtaq's Picnic in Breaking Through Horizons*. 1st eds. Cairo. Library of Religious Culture. 2010. vol: 1. p: 40.

¹¹ Al-Idrisi, M. Nuzhat al-Mushtaq fi Khtiraqi Al-afaq or *Al-Mushtaq's Picnic in Breaking Through Horizons*. vol: 1. p: 99.

¹² Al-Zuhri, M. Kitab al-joghrafia or *Geography book*. Investigation: Muhammad Haj Sadiq. 1st edition. Cairo. Library of Religious Culture. P: 44.

¹³ See : Gemsmongers. Emraude [Internet]. [cited 26 Aug 22]. Available from:

http://www.gemsmongers.org/pierre_precieuse/pierres_et_gemmologie/emeraude_provenance.htm

¹⁴ Giuliani G, Chaussidon M, Schubnel H-J, et al. Historique des gisements d'émeraude et identification des émeraudes anciennes (1ère partie) [Internet]. 2000a [cited 03 Apl 22]. Available from: <http://www.cprg.cnrs-nancy.fr/Science/Emeraudes/AFG1.html>.

¹⁵ Al-Maqrizi, A. Al-mawa'dh wa Al-i'tibar bi dhikr al-khitat wa al-athar or *Sermons and consideration by mentioning plans and monuments*. Vol :1. P: 233.

¹⁶ Al-Tifashi, A. The flowers of ideas in stones' jewels. Investigation, commentary and explanation: Muhammad Youssef Hassan and Mahmoud Bassiouni Khafaji. 2d eds. Cairo. National Library and Archives. 2010. P: 80

Al-Tifashi, A. The flowers of ideas in stones' jewels. Investigation, commentary and explanation: Muhammad Youssef Hassan and Mahmoud Bassiouni Khafaji. 2d eds. Cairo. National Lib

¹⁸ Al-Maqrizi, A. Al-mawa'dh wa Al-i'tibar bi dhikr al-khitat wa al-athar or *Sermons and consideration by mentioning plans and monuments*. Vol: 1. P: 233.

¹⁹ See : Giuliani G, Chaussidon M, France-Lanord C, et al. *L'exploitation des mines d'émeraude d'Autriche et de la Haute-Egypte à l'époque Gallo-Romaine: mythe ou réalité?*. Pp : 21-22.

²⁰ Al-Maqrizi, A. Al-mawa'dh wa Al-i'tibar bi dhikr al-khitat wa al-athar or *Sermons and consideration by mentioning plans and monuments*. Vol: 1. P: 194.

²¹ Al-Dimashqi, M. Nukkhato Dahr fi 'ajaibi al-bari wa Al-bahr or *The elite of time in the wonders of land and sea*. Petersburg. Imperial Academy Press. 1865. pp: 67-68.

²² Grundmann G, Morteani G. Multi-stage emerald formation during pan-african regional metamorphism: The Zebara, Sikait, Umm Kabo deposits, Southern Eastern desert of Egypt. Pp: 176-178.

²³. Djebbar A. Une histoire de la science arabe. Entretiens avec Jean Rosmorduc. 1^{ère} éd. Paris: Eds du Seuil; 2001.

²⁴ Qari, L-L. Turathuna al-ilmi wa al-hayat al-mo'asirah or *Our scientific heritage and contemporary life*. In: Science in Islamic Societies, Historical Approaches and Future Prospects. Supervision: Abatiwi Muhammad. Proceedings of the symposium held in Rabat on April 16-17, 2004. 1st eds. Casablanca. King Abdulaziz Foundation. 2007: 67-93. P: 74.

²⁵ Al-Tifashi, A. Azhar al-Afkar fi jawaher al-ahjar or *The flowers of ideas in stones' jewels*. P: 286.

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