# THEN, THERE WERE MINES

**Volume 1**

*From 'Minas de Almagrera S. A. 1944-58. Andrés Sánchez Picón & Isabel García Jiménez*

*Margaret Davies*

*2020*

# Chapter 1. The Sierra Almagrera

**1.1. The geography and geology**
**1.2. The wealth of minerals and the mineral's wealth**

**Part 1. The geography and geology.**


*The Sierra Almagrera.*
*Club de Montaña. Desamparados.*

The Sierra Almagrera is a small mountain range in the Province of Almería. It runs parallel to the Mediterranean coast from Villaricos to Pozo del Esparto, the coastal border between the Provinces of Murcia and Almería. A mere 12 kilometres in length, 4 kilometres in width and with a highest point at 367 metres, the Sierra Almagrera is one of the many ranges within the internal, southern zone of the Baetic Cordilleras.

The Baetic Cordilleras comprise the Andalusian mountains of south-eastern Spain. There are two distinct zones, the northern, external zone runs from Cape Trafalgar in Andalusia to Cape Nao in Valencia, and continues in submerged form to the Balearic Islands. The southern, internal zone runs from Estepona in the Province of Málaga to the Mar Menor in Murcia Province.

*The geology of the two distinct domains of the Baetic Cordilleras.*

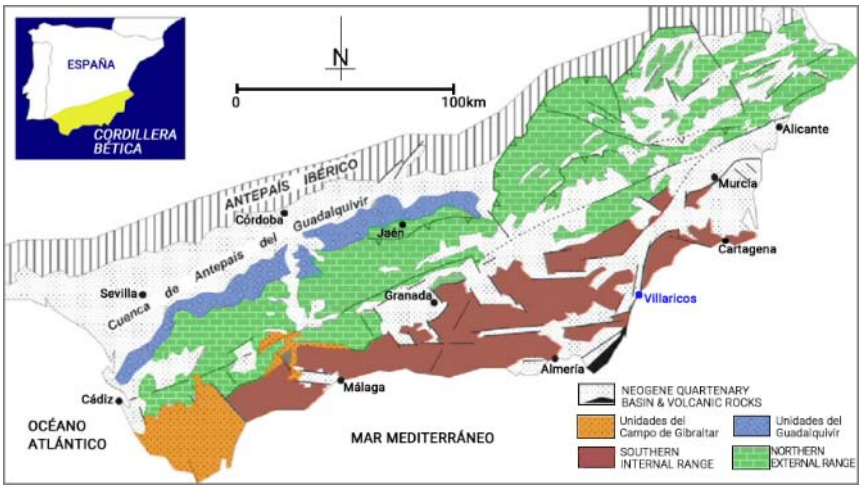
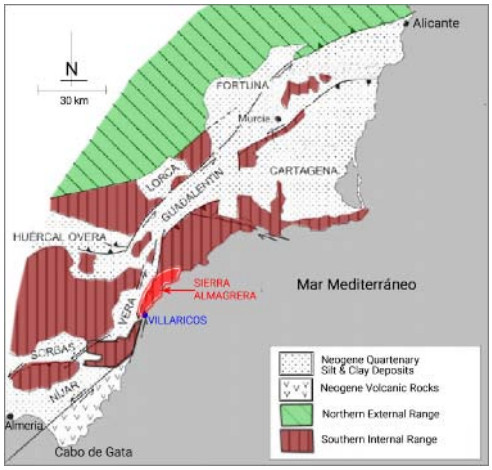
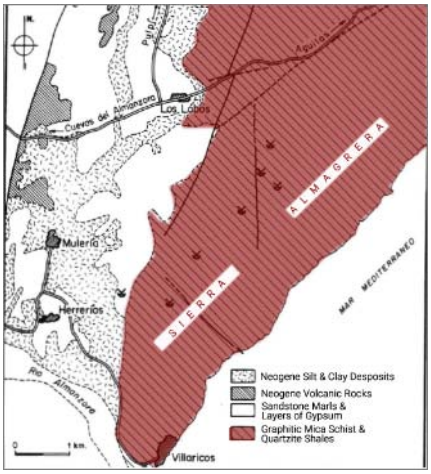



*Diagram (right & below left)*
*Registro de eventos del Messiniense y Plioceno Soria,*
*Corbí et al.*



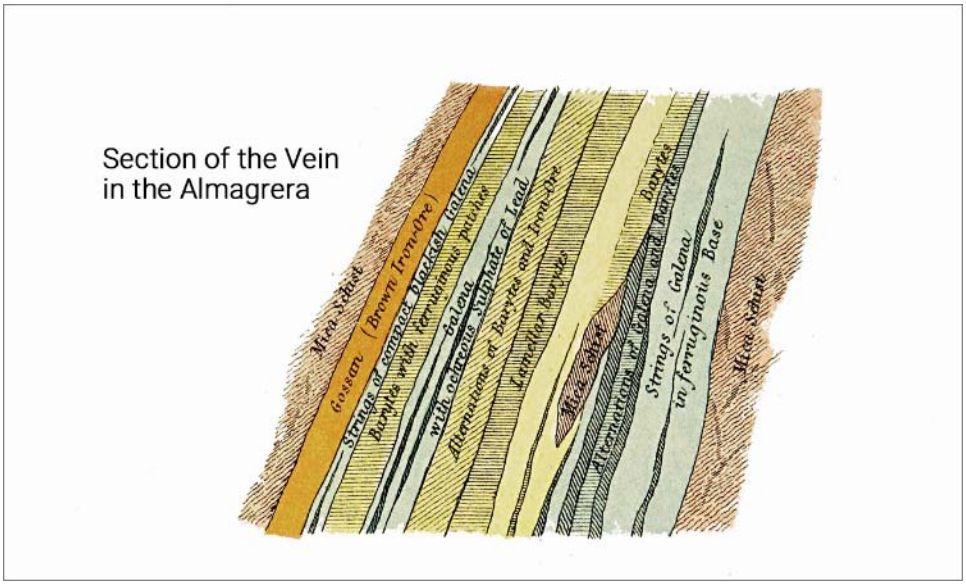

*Left, focusing in on the Sierra Almagrera.*

*Right, the geology and position of the deposits of the Sierra Almagrera and the Las Herrerías basin.*
*Guinea and Ruiz*



The Sierra Almagrera appears, on the surface, to be an insignificant part of this massive belt of mountains, but in its day its punched well above its weight. A closer examination of the geology of the area gives a clue as to why. The Sierra was formed between 54 million and 25 million years ago during the Palaeogene Period, a time of great change, with the collision of the African and Eurasian plates. Over millions of years, the earlier sedimentary rocks were folded, faulted and metamorphosed by the great heat and pressure of the collision. The new rocks are mainly slate and schist. Hot water up to 200°C, circulating through the rocks dissolved some of the minerals at depth and carried the chemical ions in solution towards the surface. These hydrothermal fluids cooled and mineral crystals precipitated in faults and fissures forming the valuable mineral veins.

The most useful minerals are the metal ores: galena [lead sulphide], sphalerite or blende [zinc sulphide], chalcopyrite [copper sulphide], pyrites [iron sulphide], haematite [iron oxide] and barite [barium sulphate]. The common waste, or gangue, minerals are quartz [silicon dioxide], and calcite [calcium carbonate].




*A look inside a single vein shows its riches.* *Simonin.*

The easiest rock to recognise is the slate which is underfoot as you climb up the mountains' tracks, where clear examples of foliation or pleating can be seen. Evidence of the great forces that formed the Sierra can be seen when the slate is cut into, revealing mineral veins which have been thrust upwards.

*Pleating, or foliation of the slate.*

*A vein of quartz pushed upwards through the slate.*

The colour of the rock means that there is no mistaking the presence of iron in the area shown below.

*A localized outcrop of iron ore.*

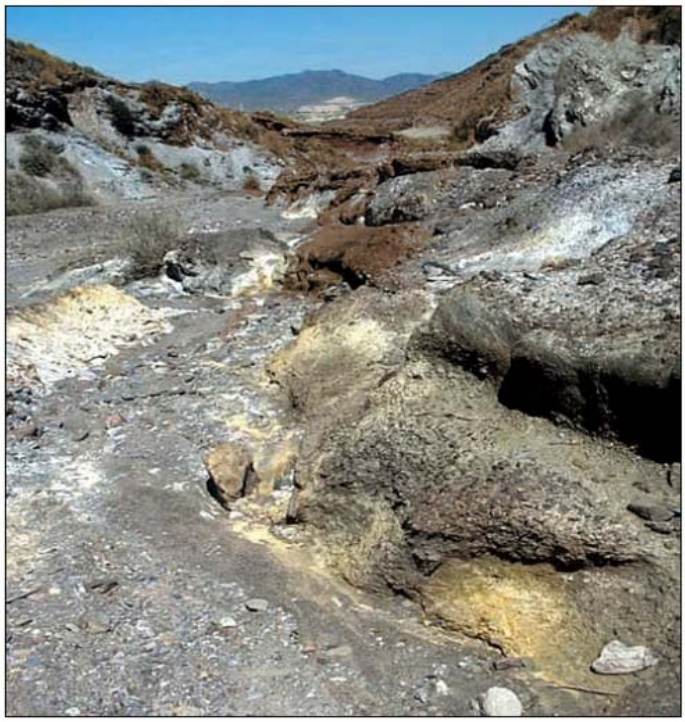
Below, an “iron curtain” is draped over the sandstone marl at the foot of the mountain.

The galena (lead sulphide) was mined here as early as 3000B.C. The Phoenicians and later, the Romans, delved into the mountainside. The Roman mine at El Arteal could be explored until quite recently, but now only a short part of the entrance gallery is passable. Even so, that is sufficient to make you marvel at the quality of their workmanship. The gallery roof and sides look as if they have been excavated by machine.

*The entrance and gallery to the Roman mine.*

What really put this area on the map, was the discovery, in 1839, of Argentiferous Galena. That is lead ore with a small percentage, typically 1-2%, of silver. Despite its low percentage, the silver by-product far outweighed the lead in terms of revenue. With the 1-2% silver worth 300 times more per tonne than the 80% lead in the ore per tonne, the resulting Silver Rush wasn't surprising. In a short space of time the entire Sierra had been demarcated and registered. In all, 1,700 shafts were sunk. Not all of these were exploited.

The area is also famous for the discovery and naming, in 1852, of potassium/iron hydrous sulphate by August Breithaupt. He called this new, yellow mineral Jarosita (Jarosite) after the barranco where he discovered it, called the Barranco del Jaroso. The barranco itself was named after the hundreds of yellow Jara, or rock rose bushes that grew there. While much of the Jaroso valley remains a contaminated wasteland of spoil tips and tailings, Jara is making a comeback.
In May, especially after a wet Spring, many slopes are once more carpeted in its yellow blooms.



*The effect of contamination in the Barranco del Jaroso.*

*The Jara or rock rose that gave the Barranco del Jaroso its name.*

Water is needed to form Jarosite, so when it was discovered on Mars in 2004, it was concluded that water must have been present at some time in that planet’s history.

**Part 2. The wealth of minerals and the mineral's wealth.**
The first question was, what were they mining? The second was, why? These are some of the facts mined from Wikipedia.

**Galena. (lead sulphide)**
This is the principal ore of lead. It can contain copper and zinc, both of which have been exploited in the Sierra, where it also contained silver. Its low melting point makes it easy to smelt, giving off Sulphur Dioxide.

The Ancient Egyptians used galena to make kohl, which they put around their eyes in order to mitigate the glare of the sun and to repel flies.

As it is a semi-conductor, galena was the crystal in the old "crystal" radio where it was used as a point contact diode to detect radio signals. The "cat's whisker" was a galena crystal on a safety pin or a piece of sharp wire.


*Cat's whisker radio receiver.*

The use of lead in paints, pottery glazes, petrol, solder, ammunition, fishing weights, pesticides, cosmetics, glass and plastics has been virtually discontinued due to its toxicity. However it is still used in batteries and lead shot, also, lead sheet is still obtainable.

The Romans used lead for pipes. "plumb" is Latin for lead, hence plumbing and plumber in English. They produced bars of lead stamped '*ex arg', or de-silvered,* to indicate that they had extracted any silver from it.

**Haematite. (iron oxide)**
The rusty-red iron ore. The driving force behind the Industrial Revolution and beyond. The raw material for steel. Its uses and applications are too numerous to mention. The haematite in the Sierra and at Las Herrerías was of such good quality that it needed the minimum amount of processing and was the source of great wealth at the end of the 19th and beginning of the 20th centuries.

*In these rock samples the white is quartz, the black is galena and the rust-coloured is pyrite.*

**Pyrite. (iron sulphide)**
Fools' Gold. The name pyrites is from the Greek meaning “of fire” a reference to the fact that it sparks when struck against a steel. It was used in early firearms.

Crystals of pyrite, often set in silver, were used to make Marcasite jewellery, (which does not contain any marcasite). Such jewellery was very popular during the years of the local mining boom.

It was also used as a source of sulphuric acid.

Like galena, pyrite is a semi-conductor, and was used in early radio sets. Pyrite wave detectors were as sensitive as modern diode detectors.

Currently, the use of pyrite in photovoltaic solar panels is being studied.

**Zinc Sulphide.**
Zinc sulphide was used with copper to make brass and was widely used as a pigment and in skin ointments. It is phosphorescent and is used on X-ray and T.V. screens.

**Silver.**
Silver was found in association with galena which started the Silver Rush. More importantly native or pure silver was found in Las Herrerías.

**Barite. (barium sulphate)**
Barite is the principle ore of barium. Its name derives from the Greek word “barys” meaning heavy. It is exceptionally heavy for a non-metallic mineral and is used extensively as a weighting filler in paper, cloth and rubber. Playing cards owe their weight to it as do mud flaps on trucks.

It is used as a weighting agent in drilling fluids, or muds, for oil and gas exploration where it suppresses high pressures and helps prevent blow-outs. It is also widely used as a pigment in paints.

Barite is able to block X and Gamma ray emissions so is used to make the high density concrete used for shielding. Barium meals and enemas are used to X-ray image the tissues of the oesophagus and colon.

*Opencast mining for barite in Las Rosaz.*

*Photo J M Germán Celilia.*