NEW DISCOVERIES IN THE MINING HISTORY OF TURKEY IN THE NEIGHBORHOOD OF GÜMÜŞKÖY, KÜTAHYA

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ABSTRACT. — In the mining history of Turkey lead and silver mining has a distinctive place, as well as copper. One of the important places where lead and silver mining had started thousands of years ago and continued through the Ottoman period is Kütahya region. Investigations in the neighborhood of Gümüşköy (Kütahya) revealed old metallurgical remnants and findings of old underground mining both of which are very important for the mining history of Turkey. At the Aktepe mine site, adits dating as early as the beginning of second millennium B.C. and an «ore crushing and grinding tool» of the second century A.D. found at the entrance of another adit are among the above mentioned discoveries. These remnants are the best known examples at present.

INTRODUCTION

Old mining activity at Gümüşköy and surroundings has an important and distinct place in the mining history of Turkey. The reason for this is that this area is one of the rare mine sites in the world where old underground mining and metallurgical activities had continued for a very long time-from ancient times up to the beginning of Ottoman period. This activity had only been interrupted by wars and natural disasters like earthquakes.

The first exploration carried out, under technical circumstances of its time, at the mine site SW of Gümüşköy revealed a series of very old mine wells with downward entrances. As a result of examining dumps around these pits, it was concluded that ancient miners had obtained only silver and gold from these mines (Fischbach, 1900).

In another study it was explained that on the mountains South of Gümüşköy there is evidence proving silver mining operations in the ancient times (Ziegler, 1936).

A later study on Gümüşköy area showed the existence of an old operation site and defined this as an important ancient mining activity (Pilz, 1937).

In addition to these, some mountain and village names including «gümüş» (silver) are another clue supporting the idea that present day traces of old mining activities are related to silver mining in general.

The entrance of an old production adit uncovered by a trench, dug by Etibank at Tavukkıran Tepe south of Gümüşköy, is 80-90 cm wide (Photo 1). This N-W trending, unsupported adit had probably been opened for lead exploitation. Here, following the coarse-crystallized galena vein, the ancient miners had extracted the apparent ore. There is no more lead ore left now. The reason for this is that, the ancient miners, tracing the lead vein, had operated this pit for a long time. At this locality the thickness of dump is approximately 4 meters. Within this dump pieces of old ceramics and some animal bones are found. Ceramics date probably second or third centuries A.D. This, at the same time, must be the period including the mining activity at Tavukkıran Tepe.

Foto 1

Foto 2

Foto 3

Aktepe old mine site is about 3 kilometers away from Gümüşköy. Explorations carried out by Etibank on some parts of this area since 1975 revealed three ancient adits. One of these adits is an important discovery displaying old Anatolian subsurface mining. Furthermore, at this site some ancient materials used in mining activity both in B.C. and A.D. era were found.

DISCOVERIES AT GÜMÜŞKÖY AND AKTEPE MINES

Gümüşköy Discoveries

Place and description ofdiscoveries. — Gümüşköy is approximately 7 kilometers south of Köprüören township, Kütahya province. Dwelling place in Gümüşköy is on a hill, and it is covered mostly by a thick layer of slag of ancient metallurgy. This slag accumulation is a result of thousands of years of smelting operation. The ore necessary for such a process should have been obtained from the nearby ore deposits. For example, at peresent nearest fundamental mineralization areas are at Aktepe, Tavukkıran Tepe and Sığırereği Tepe.

The results of optical spectrographic semi-quantitative analysis of slag samples collected from various places of Gümüşköy, by means of shallow excavation, are given below:

Fe greater than 10 %	Ag 0.002 %
Pb greater than 1 %	Au absent (DL. 0.002 %)
Zn 1 % (approximately)	As 0.15 %
Cu 0.04 %	Sn absent (DL. 0.002 %)
Ni 0.004 %	Co absent (DL. 0.004 %)

As seen from these results, it is difficult to decide which ore had been smelted at this ancient metallurgical site. Because here ore smelting had not been carried on to get only one specific type of metal. This activity which had continued for centuries had aimed to obtain various metals and this had resulted in present day's mixed slag accumulation. However, from the verification of above analysis it is obvious that ore smelting to get silver had taken place at this site.

The outer surfaces of slag have partly altered, peculiar appearance. They are, in general, dull black and heavy. Inner parts are nonvesicular and dull black. Some have oxidation stains. In addition to these, slags contain iron and hence can be magnetized. The heaviness of slags is caused by iron and lead. The presence of these metals in the slag is not a result of bad smelting process but that smelting had been practiced to get another metal.

At Gümüşköy in some excavations for the foundations of buildings, ancient column heads are found inside the-slag mixed with soil. Furthermore, ancient coins belonging to different periods were encountered here. These ancient Roman, Byzantine and Islamic coins may give some definite periods for the metallurgical activities at this site. However, by a never study this date may be extended as early as firts millennium B.C. The oldest date, known at present, for this metallurgical site is firts to third centuries A.D.

Aktepe Mine Discoveries

Place and description of discoveries. — Aktepe mine site is close to Gümüşköy. It is located SW of Gümüşköy (Fig. 1).This place is one of the three polymetallic mineralization fields around here. Among them this one is the most important silver deposit. Main metals of polymetallic ore at the Aktepe mine site are Pb, Zn, Sb and Ag (Vıcıl, 1982.)

Extension of dump at Aktepe is 1 square kilometer and approximately 2.5 million tons. This old mine site has lack of vegetation. On nearby area there are some weak juniper trees. The absence of vegetation at Aktepe is a result of sulphureous ore dump. And the sparsity of vegetation on nearby area may be due to the fact that ancient miners had met their need for firewood from this area. Furthermore, the size of slag heap implies that enormous amount of firewood should have been burnt for smelting process at this site. And the wood necessary for this process may have been obtained from the nearby pine and juniper forests.

During the exploration drilling and trenching carried out by Etibank in the years between 1975 and 1979, three ancient adits were discovered at the Aktepe mine site. These adits are arranged in a row approximately at 500 to 700 m intervals in the N-S direction (Fig. 1). Ancient miners had built these adits generally in the E-W trend, but tracing the mineralization zone they had changed the direction. These adist are unsupported and they are in the size enabling a man's entrance.

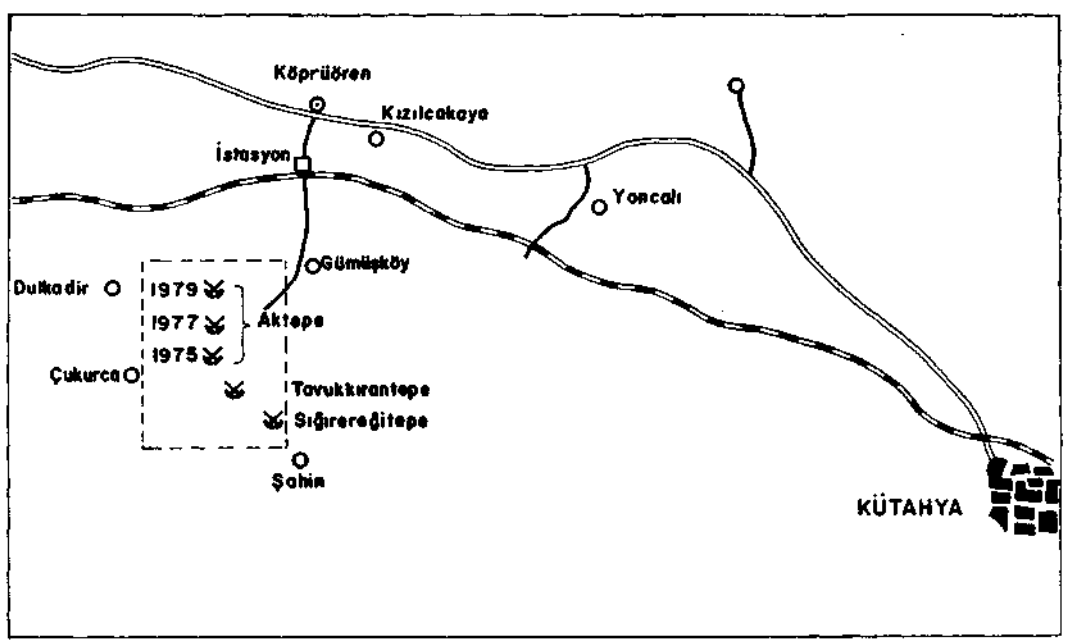

Fig. - 1

These adits discovered in 1979 are the second important findings belonging to the B.C. era in Anatolia. In another adit discovered in 1977 a «crushing-grinding tool» which had been used in ore dressing was found.

Discovery in 1979. — During the survey conducted in 1979, at the end of a 74 m - long exploration adit, south of adit face and on the floor, an ancient production site was discovered (Fig. 2). This is one of the most interesting and the oldest examples in the world.

This ancient production site starts with a downward entrance and then passes into a wider production space. Connected with this space horizontal, downward and upward adits, tracing the ore-rich zones, take place. Adits are concentrated to the east, north and south respectively, and they diminish to the west. This complex had been systematically and intelligently built to provide a rational production, in accordance with the technical circumstances of its age. All of these adits are un-

supported and one can hardly move inside. Here, it can be observed that dump of the old production is left as small heaps at some definite places. This seems to be a proper and deliberate arrangement in order to carry the ore and the dump to the outside respectively. Lab analysis of the samples taken from this dump shows that they include silver-bearing minerals (Vıcıl, 1982). The same phenomena can be observed in the selectively collected galena samples.

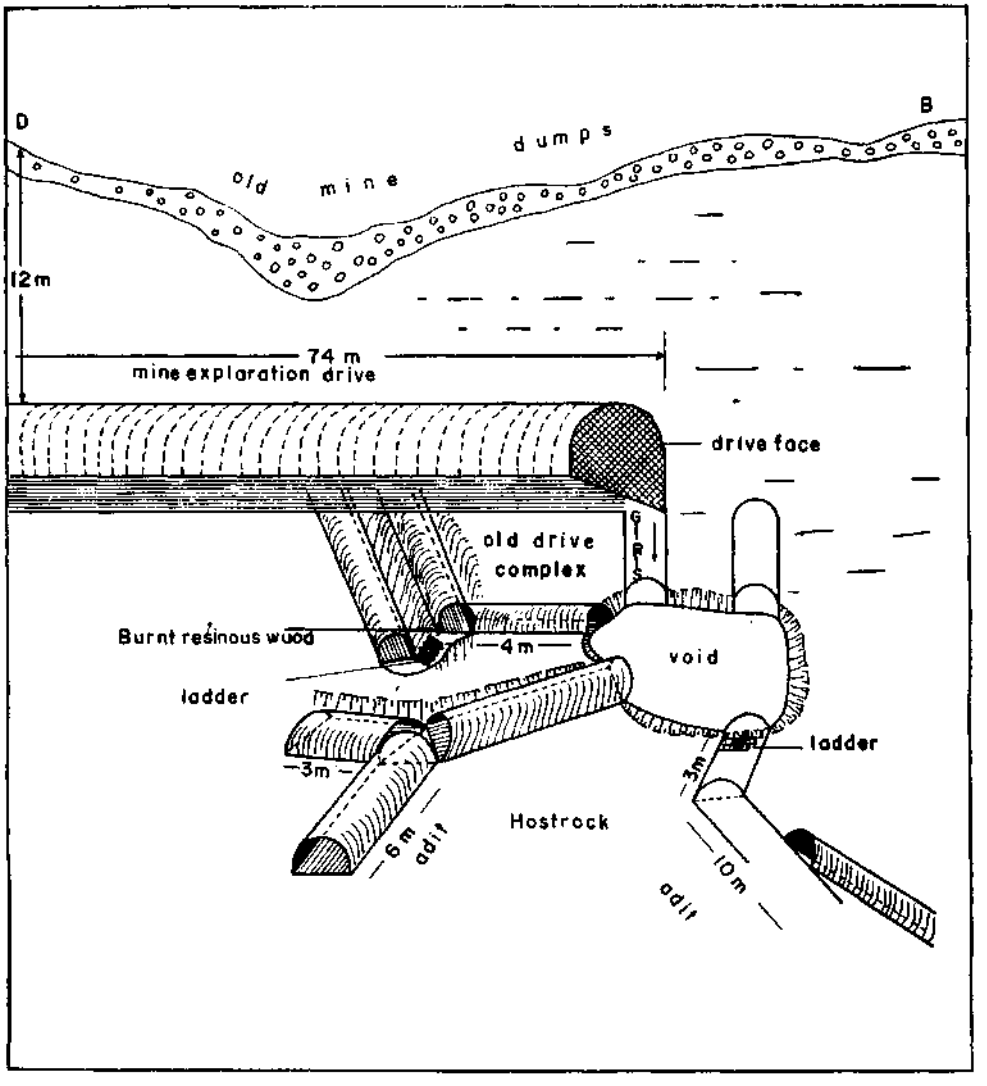

Fig. - 2

Between two adits, taken place east of large space in the N-S direction, there is an elevation difference of 3 to 3.5 meters approximately. The difficulty of working and transportation due to this elevation difference is eliminated by a stone stairway with six steps (Fig. 2). A burnt remnant of kindling wood, in a preserved form, was found on a small platform. This platform having the measurements of 50 cm X 75 cm is located NE of the first step of the stairway. Ancient miners

might have used kindling wood, instead of oil lamp, for illumination. This burnt piece of wood was analysed at the Laboratories of the Aachen University, Germany by C-14 carbon dating method (Yiğitgüden and Friedrich, 1981). The results taken "from the paper related to this subject are given below:

3900 ± 85 before 1950 A.D.

1950 ± 85 B.C.

Thus, the date of underground mining activity at Aktepe is determined as including approximately the beginning of the second millennium B.C. However, it should be noted that this age cannot be taken as the date of first or last exploitation activity in this adit complex.

Similar discoveries. — The oldest production site in Anatolia is at Kozlu-Gümüşlük mining site in the region of Tokat-Erbaa. This place is 45-50 meters below the surface. (Kaptan, 1982.) This is the oldest copper mine in Anatolia which had been operated from the beginning of the forth millennium B.C. up to the A.D. times.

Another discovery with regard to the B.C. era was made at the Anayatak open pit mine in Murgul, Artvin province. Here, a miner's shovel carved from wood was found. With the aid of this material an ancient adit, non-existing now, was dated from the second half of first millennium B.C. (Kaptan, 1977).

In addition to these, during the drilling exploration conducted in various regions of Anatolia, old mine sites belonging to the A.D. times were encountered (Kaptan, 14)82).

The discovery at Gümüşköy-Aktepe is very interesting as an ancient adit complex. This is the second oldest discovery dating as early as the beginning of the second millennium B.C.

Discovery in 1977. — At Aktepe an ancient adit was uncovered by a trench, called GY-5, opened by Etibank during mineral prospecting work in 1977 (Fig. 1).

About 2 meters away from the entrance of this adit, a «crushing-grinding tool» used for ore dressing was found (Photo 2). On top of this tool a grinding stone and on the floor near the tool a crushing stone were found. Close to this «ore crushing-grinding tool» pieces of a dough colored, unpainted clay pot with a wide brim were encountered. These pieces of ceramics which can also be used to determine the age of ancient adit and «crushing-grinding tool» date from the second century A.D. On the area 50 to 100 meters away from this adit tiny pieces of ceramics together with goat (Capra) and pig (Sus scrofa Linneaus) bones of the same age were found in abundant amount.

General description of ancient «ore crushing-grinding tool»

Locality: Aktepe

Name: «Ore crushing-grinding tool». It consists of three different parts : (a) stone mortar; (b) crushing stone; (c) grinding stone.

Measurements (in cm): a. Stone mortar (Photo 2, Fig. 3)

1. Length: 28-24 cm

2. Width: 24-21 cm

3. Thickness: 9-8 cm

4. Crushing-grinding sink: 19x16 in dimensions, depth 2 or 3 centimeters.

5. The result of petrographic analysis: Dolomite (partly ankeritized). Sample is composed of mosaic formed, equal grained dolomite crystals. These crystals, at some places, are colored by limonite. At these places, development of ankerite crystals is noted. In the cavities, coarse calcite crystals can be seen. As a result, the rock is dolomite partly colored by limonite, and it includes lesser amount of ankerite.

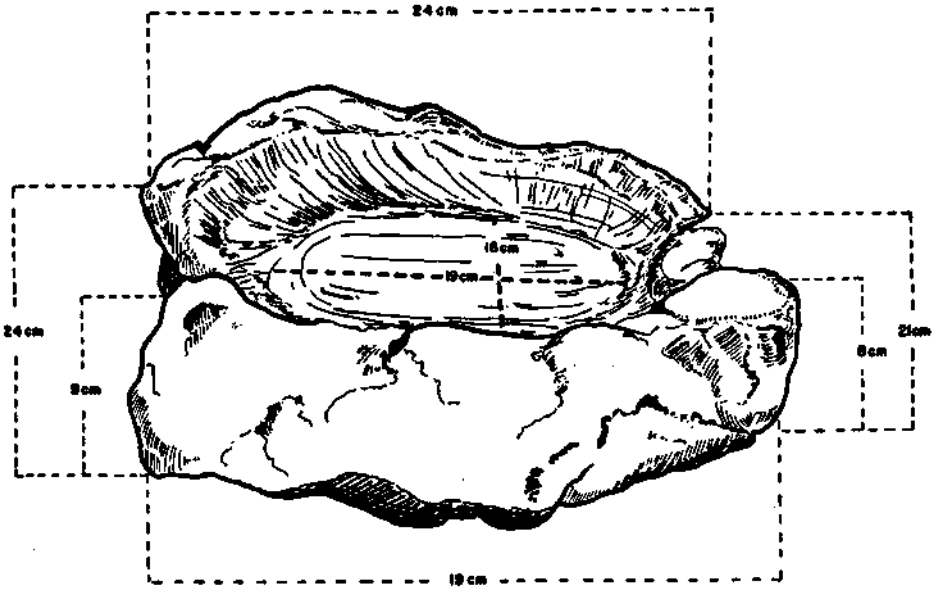

Fig. - 3

b. Crushing stone (Photo 3)

1. Diameter: 8.5 cm

2. Characteristics: Lost its spherical form due to over-using. It might have been used at the stage socalled «medium crushing».

3. The result of petrographic analysis: Millstone. Sample is composed of randomly scattered, angular, various-sized quartz crystals cemented with silicon and clay. Quartz crystals usually have cataclastic texture. They display traces of crushing, pressure twinning and wavy extinction. Apart from quartz, there exist feldspar, sericite, zircon, opaque tourmaline crystals and rock fragments.

c. Grinding stone (Photo 3)

1. Diameter : 7 cm

2. Characteristics: Lost its spherical form due to continuous usage. Surrounding the material there is a 2 cm -wide shallow groove. This groove should have been made to enable the hand's grasp of the grinding tool totally and thus to provide easier working. The bottom of grinding stone has a concave shape, 5 cm in diameter. In this way, it functions as a grinding tool easily.

The usagt of «ore crushing-grinding tool». — Clearing the ore extracted from the pit off the gangue had been the first stage of ore dressing in the ancient times, too. At this stage, stone mortar and «crushing-grinding tool» had been indispensable instruments. However, at the Aktepe mine site coarse crushing must have been carried on in stone mortars deeper than «crushing-grinding tool»- as in the case observed at Denizovası (Kayseri province). These instruments are deeper, bigger, and

they have higher degree of hardness. Ancient miners might have done the medium and fine crushing and grinding in this «crushing-grinding tool». This tool had been designed to prepare the coarsely-crushed ore for grinding and then to grind this material. The reason for this interpretation is that crushing-grinding sink of this tool is not too deep (2-3 cm) and the other dimensions are small (24 X 28 cm) as well.

This tool is the primitive Anatolian'ancestor' of various types of today's crushers used at the first stage of ore dressing.

CONCLUSION

These remains discovered in the neighborhood of Gümüşköy are important evidences demonstrating the higher level of ancient underground mining and metallurgical activity in this region. Here, the oldest metallurgical site is at Gümüşköy. The presently known date of this site is first to third century A.D. The ore necessary for smelting process continued for centuries should have been provided from the nearby ore deposits at Aktepe and Tavukkıran Tepe.

The adit complex discovered at the Aktepe mine site in 1979 and dated as early as the beginning of the second millennium B.C. is one of the most interesting discoveries-not only in Anatolia but also in the world.

When the remains of this underground production site are examined it can be concluded that a proper and intelligent underground mining activity had been practiced here. The other discovery related to the Aktepe mine is «the ore crushing-grinding tool» found in 1977. This tool might have been used in the process of medium-fine crushing and grinding. It belongs to the second century A.D. and it is the first known example used for such a purpose.

In addition to these, Aktepe mine site must have been one of the oldest places supplying lead and silver not only for the surroundings but also for the whole Kütahya region.

These discoveries can be evaluated as very important evidences for the mining history of Turkey.

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REFERENCES

Alpan, S., 1969, Cevher zenginleştirme: MadenTetkik ve Arama Enst. Publ., Eğitim serisi 4, p. 2-3, Ankara-Turkey

Fischbach, W., 1900, Kütahya civarında Gümüşköy, kurşun-gümüş madeni hakkında rapor: Maden Tetkik ve Arama Enst. Rep., 374 (unpublished), p. 1-2, Ankara-Turkey.

Kaptan, E., 1977, Murgul madenindeki Anayatak kökenli eski devirlere ait bir buluntu: Maden Tetkik ve Arama Enst. Bull., 89, 90-94, Ankara-Turkey.

———, 1982, Türkiye madencilik tarihine ait Tokat bölgesini kapsayan yeni buluntular: Maden Tetkik ve Arama Enst. Bull., 93/94, 150-162, Ankara-Turkey.

Pilz, R., 1937, Şaphane, Murat dağ ve Eğrigöz dağ mıntıkalarındaki müteaddit maden yataklarında yapılan istikşaflar hakkında iptidai rapor: Maden Tetkik ve Arama Enst. Rep., 641 (unpublished), p. 15, Ankara-Turkey.

Vıcıl, M., 1982, Gümüşköy (Kütahya) Aktepe Pb-Zn-Sb-Ag cevherleşmesi: Ege Üniversitesi Yerbilimleri Fakültesi, Thesis of Doctorate (unpublished), p. 9-12.

Yiğitgüden, H.Y. and Friedrich, G., 1981, Gümüşköy madeninin tarihçesi: Etibank Bülteni, sayı 31, p. 4, Ankara-Turkey.

Ziegler, J., 1936, Kütahya Gümüşköy mevkiinde barit-grafit madenleri hakkında muhtasar rapor: Maden Tetkik ve Arama Enst. Rep., 535, p. 1, Ankara-Turkey.