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ANCIENT GEORGIAN IRON METALLURGY AND ITS ORE BASE

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ABSTRACT. In the almost 5000 years long history of Georgia metallurgy has always played an important role. Its specifics, development, ups and downs and new reincarnations in other times and places, over and over again are the main story in this paper. Southern Georgian metallurgical centres are considered the birth place of the iron metallurgy of the world and have played leading role on the markets of the then known world during the whole Antiquity. In the Middle Ages, however, Georgian metallurgy is forced to hide in the Northern mountains to keep away from aggressive intruders and suffers from restricted ore base and isolation. The last flash of the Georgian iron metallurgy is seen in the South Eastern territory in XIX century. The present day Georgian metallurgy is entirely based on import.

Introduction

Georgian history dates back for several millennia, having its roots in the second half of the III mill. BC. Ancient Georgian tribe Tubal (Tuval) is mentioned in the Bible as founder of the metallurgy and blacksmith art. Ancient Georgian metallic artefacts are found spread across the entire Middle East – Mesopotamia, Syria and the Anatolian Kingdoms.

The historic subdivision of the Middle Bronze Age in Western Georgia relies on evidence from the compositions of the produced metals. In the beginning the main product was the As copper, replaced in turn by As-Sb copper and Sn-Cu alloys. Thus, the Georgian antique iron metallurgy did not appear in an empty environment, but represented a logical continuation of the pre-antique metallurgy. A specific proof for the technological succession is the fact that regardless of the technical difficulties connected to the new material, ancient craftsmen kept trying to reproduce in iron the same shapes that they used to produce from bronze. This phenomenon is supported by abundant archaeological findings in Samtavro, Gebi, Sukhumi Mountain, Svaneti, Lower Kartly etc.

Records for the high level of iron metallurgy and black smith crafts of the ancient South-Western Georgian tribes are available in written sources, while recent archaeological findings witness similar levels of technology for Kartly and Western Georgia.

Stages of development of Georgian metallurgy

The ancient centres of metal production were distributed mainly in the South-Western, South-Eastern and Northern Georgian provinces. The first one was situated in the Chorokhi River catchment, within the ancient Shavsheti, Djavakheti and Tao-Klardjeti, as well as on the territory of present day Guria. The South-Eastern province covered the Southern areas of Ancient Iberia, with the especially important from metallurgical point of view Bolnisi and Alaverdi (present Armenia) districts. The Northern province covered the mountainous parts of the Great Caucasus, at the areas of Abkhasia, Svaneti, Imareti and Racha (Fig. 1).

Centres of metallurgical production of the Southern zone (Lower Caucasus Mountainous area) played leading role during the entire Antiquity. This is a whole historical stage in the development of Georgian metallurgy, lasting until the Middle Ages. During this period the metallurgical importance of the Northern zone is insignificant, except the Svaneti gold bearing region, well known for its gold production since ancient times but having some experience in iron melting, too. This experience becomes the seed of the technological growth of the Northern zone in the beginning of the Middle Ages, when the Southern zone lost its importance. Finally, in XVIII and XIX c. metallurgical production centres moved to the South again, but this time in the South-Eastern part of the country Borchalo (Bolnisi) – Alaverdi regions.

It should be emphasized that metallurgy has always been an important component of the Georgian economy since the very distant past. Under different historical circumstances it has been temporarily depressed or displaced, but kept reviving over and over again. This fact is reflected in numerous written sources back to the most ancient ones.

Antique metallurgy of the South

Single finds of metallic artefacts are known in Georgia since the early agricultural settlements VI-IV mill. BC (Khramis Didi-Gora – Menabde et al., 1978, and Arukhlo – Gogelia, Chelidze, 1985). According to Gzelishvili, the oldest metallurgy on Georgian territory has been located in the Bolnisi region, rich in early agricultural settlements, too. This is confirmed by the remnants of ancient copper ore extraction close to Tsitelisopeli and its vicinity (Gzelishvili, 1967).

Fig. 1. Map of ancient Georgia

During the Antique Period the Georgian South used to produce iron, copper and copper alloys, gold and silver. This is registered in Greek and Roman written sources describing the metallurgical skills of the Mossinik, Halib and Tubal proto-Georgian tribes.

However, distinct specialization was marked. Mossiniks, who had active trading relations with the Greeks, not only in their close vicinity (Kerasund), but also in the rather distant Trapesund, have been well known by their superb copper, bronze and brass. According to Aristoteles their bronze could be easily recognized by its whitish hue. He notes that "Mossiniks do not use tin in their bronze, but some local earth, which they smelt together with the copper".

On the other hand, Xenophontus describes iron axes in the Mossinik armament, but emphasizes that they are produced by the Halibs, who live at the Western most end of their territory (South-Eastern Black Sea coast) and their dominant occupation is iron smelting and fabrication. Still Apollonius of Rhodes (Απολλώνιος Ρόδιος) (200-250 BC) notes that Halibs "…do not grow cereals, neither grow fruits, nor they pasture cattle in their lush meadows but instead, they dig their hard ferrous land and produce iron to trade for everything else. Their only occupation is iron production what they do day after day, from sunrise to late evenings" (Antipenko, 2005). This fact is also confirmed by Xenophontus (Xenophontus, 1994).

It is rather obvious, that such narrow specialization of some tribes leads to a remarkable rise of product quality, since it creates a perfect collaborative and targeted social environment. Aristoteles claims that "halib iron is the best one in the world, because Halibs produce it in their own secret way". He calls it "white Halib iron" (Kosidovskii, 1975) which, according to its cited features used to be a kind of stainless steel.

Such specialized communities used to produce superb metallic artefacts in amounts vastly exceeding their own needs, giving them ground for wide trading relations with closer and more distant neighbours. In his comments to "Prophecy about Tyros" (prophet Ezekiel – VI c. BC) Djavachishvili (1951) emphasizes that the metallic articles of proto-Georgian tribes have been known even in such distant places like Tyros in Lebanon. Important side benefit of this trading is that it made these tribes popular and put them in the stream of the cultural development of the whole then known world, since culture have always been transferred together with trading.

The vast amount of metal objects produced in Ancient Georgia rises the question about the ore base for such a voluminous metal production. In respect to copper and silver the answer of this question is simple: there are a series of small grass-root deposits, still being used in Lower Caucasus. These are Chorokhean (Dzansul), Merissean and Alaverdian copper deposit groups.

These deposits are interesting not only for their reserves of copper ores, but also for other features, like surface outcrops and deep oxidation zones, making them easy for extraction and processing. Moreover, modest amounts of cassiterite have been found in Adjarian placers that had its importance for the production of the famous Mossinik shiny bronze.

The question about the iron ore base is a bit more complicated. The only relatively big iron deposit known in Southern Georgia is the Chatakhi. Undoubtedly, this deposit has been exploited since "the beginning of time". According to Gabuniya on the 70 km^2 mapped by him in 1933 there were 30 surface ore outcrops and each of them showed signs of ancient mining and ore processing activity.

However, the Chatakhi deposit alone could not provide the base for the world famous halib iron articles and the glory of the proto-Georgian tribes as discoverers of the iron metallurgy (De Morgan, 1926). The base for this wide metallurgical activity are numerous smaller, but convenient hematite (Madnis-zkaro) and Mn-hematite (Tetri-zkaro, Madnis-seri, Soshebi etc.) deposits in South-East Georgia. The naturally Mn enriched ores here contributed for the high quality of the produced steel.

In the South-Western territories hematite deposits are scarcer (Shekomedi) and poorer in good quality ores (rather pyroluzite earths), but the magnetite sands of Chorokhi River and the Eastern Black Sea coast play an important role here instead. According to Aristoteles: "rumors tell about the completely unusual origin of halib and ammiss iron – it is produced by sands, transported by rivers; these sands are washed several times and smelted with the addition of a special fireproof stone, which they have a lot in their country" (Kosidovskii, 1975). These magnetite sands originate from the erosion of the vast basic and ultrabasic magmatic rocks, having mean content of 11% magnetite. Iron was most probably produced by direct reduction and benefited from the natural enrichment of the source magnetite sands by Cr, Ni, Mn which additionally improved its quality.

Along with the numerous written documents, the widely developed iron metallurgy in Antique Southern Georgia is witnessed by the commonly found ancient mine workings (Fig. 2) like those in Chatakhi, Madnis-zkaro, Madnis-seri, Fakhralo etc. They are recorded as early as the beginning of XX c. by famous geologists like Abich, and the mining engineers Kosmatii, Osvald, Batzevitch and Margolius. They all witness that vast amounts of slugs are always found around these workings.

It is unknown how long did the glorious and world famous at its times South Georgian metallurgy survive, but it is known for sure that at the beginning of the Early Medieval Age it already had lost its importance and discontinued its existence.

Fig. 2. Ancient mine working (IV-III c. BC) – David Garedji, Bolnisi area

Antique metallurgy of the North

The Antique metallurgy of the North was represented by the Svaneti metallurgical centre. According to Strabo: "in the mountain creeks of this country there is a lot of gold, that barbarians extract using perforated troughs and long haired furs, where most probably the 'Golden Fleece' legend comes from". This is confirmed also by Plinius and Appianus.

The ancient Svanetian gold metallurgy becomes the seed, from which the copper and later iron metallurgical skills grow up here. In this respect the neighbouring Racha area is interesting, too. Neolithic copper metallurgy is proved in a copper-lead-zinc mineralization close to Uravi (Mountainous Racha) by the finding of an ancient ore dressing trough with stone hammers and ore pieces inside (Fig. 3) after (Mudjiri, 1987).

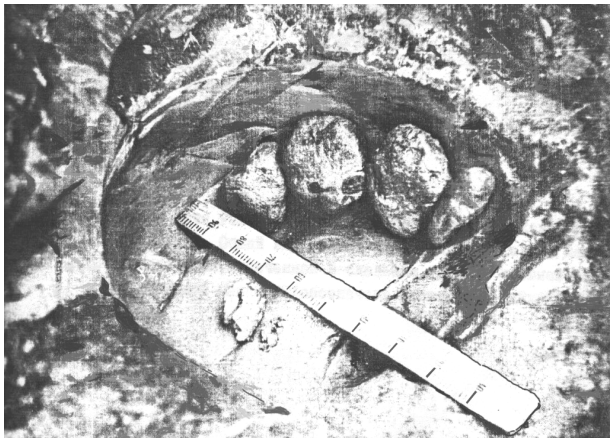

Fig. 3. Ancient ore dressing trough with stone hammers and ore pieces inside; copper-lead-zinc mineralization close to Uravi (Mountainous Racha)

Iron farming tools from the VII-VI c. BC have been found in many tombs both in Svaneti and Racha (Nigvziani, Ureki). Along with the numerous mattocks and hoes, finds of special interest represent iron shares (Mikeladze, Baramidze, 1977; Mikeladze, 1982). Slightly younger are the shares found in the Bril tomb (Mountainous Racha, IV c. BC, Gobedjeishvili, 1952) and the findings of the Archeological expedition in Svaneti in 1952. The availability of shares proves the existence of iron ploughs as early as VII c. BC.

Remains of iron metallurgy in Svaneti are recorded by Degen-Kovalevski (1935), who investigated 2 Antique blast-furnaces (out of over a dozen in the area, according to local people memories) in Shkhibar (meaning slag place), Chuberi municipality. The construction of the furnaces as well as the amount of slag there witnessed a rather extended metallurgical activity. Based on a vast historical and archeological data the author proves that Shkhibar iron production was not only for internal trade, but also targeted on export. However, this export could by no means compare to that of the Southern metallurgical region, and the main reason for this was the pretty short ore base of the Northern metallurgy. This shortage, however, yielded specific metallurgical techniques here, including multi-metal smelting, producing gold, copper, silver and iron from one and the same load. This specific is reflected in the name "Golden Shkhibar" used for a place known mainly by its iron production.

The trickiest point in the Northern metallurgy is the question about its ore base. The extremely high quality of the Chuberi iron objects (99.75% Fe, according to analyses performed for Degen-Kovalevski, 1935) points to an extremely pure magnetite ores, since ancient technology did not have enough power to purify impurities to such an extent. Such pure magnetite ore samples have been found at the upper level of the Shkhibar metallurgical centre. Its analysis shows 91.07% Fe, few compounds inert in smelting (SiO_2<5%, CaO<3%, Al_2O_3<0.5%) and no P or S at all. Ores with this quality are currently unknown in Svaneti, but the analytical data closely resemble the composition of ores in some Eastern Abkhazian deposits and especially Sanchar area.

Two hypotheses are trying to explain the above facts: there are (currently lost) deposits similar to those in Sanchara, somewhere in the Utviro-Kirara ridge, in the Western part of Svaneti (this hypothesis takes ground from the pronounced similarity between the two areas in geological respect; there is no local ore base and the Svaneti metallurgy was based on imported ores only. Although looking fully contradictory, if we analyze the specifics of the antique metallurgy, the two hypotheses may meet somewhere in between.

It should be kept in mind that Svanetian iron metallurgy was rooted in earlier gold, copper and silver smelting traditions. This metallurgy was usually based on small deposits that were exhausted within a couple of years. As a matter of fact, the size of the deposit was not important at that time, since the restricted engineering capabilities did not allow the miners to get deeper, even if there was plenty of ore left. Reaching few tens of meters deep the miners were forced to move to another source. This seems to have been no much hassle, since gold and copper smelting had been done in non-sophisticated furnaces that could be constructed within a couple of days or so.

Iron smelters, to the contrary, were a “High-Tech” for that time. They were not likely to be moved or left behind. Their construction was a strategic investment that needed a pretty long time to pay back. Once constructed close to some small source (that can be presumed for Shkhibar) and after its exhaustion, the blast-furnace kept being used with ores transported from more distant occurrences. In Svaneti, which is poor in proper iron ores, the process of retreating of the ore base from the metallurgical centre may have passed pretty fast. This is how metallurgical centre initially based on local ore can turn into one entirely based on imported ore.

Import based iron metallurgy was not uncommon at that time. This was possible for the following reasons:

- transportation skills of the ancient people were not at all bad; using mules they were able to cross even such extreme mountain routes like the iced ridge of the Central Caucasus;
- the iron smelting was preceded by on site ore dressing that was made close to the ore sources and used to reduce the transported amounts; according to historical records, the Svans used to have this kind of activity spread all across their territory, but used to keep these places secret;
- the overall iron consumption at that time was not high – just some farming tools and armament; the modest yearly required amounts of ore could well be transported even from distant locations;
- eventually, import based metallurgy could produce only as much iron artefacts as possible and it was not always able to satisfy the needs of the moment; records of such shortage are found in the memories of Levan II Dadiani, who explains the Megrelian slave market with the need to exchange slaves for salt and iron “so much needed nowadays”.

Medieval metallurgy of the North

The Chuberi (Svaneti) metallurgy slowly perishes and comes to its end, according to some authors in the VII-IX c., or according to others – in the X-XI centuries. Unlike the South however, at the end of XIII c. the iron metallurgy of the North revived in three new metallurgical centres, namely Abkhazia, Upper Imereti and Racha.

Abkhazian metallurgy starts playing a significant role in the first half of XIII c., when Genoan investments intrude the Caucasian territory. Main target of the Genoan miners was the silver from the rich Zn-Ag and Pb-Ag deposits in Abkhazia. This is proved by the vast number of old mines, like those in Akhizda-Akara and Akhizdirkhu, with Genoan artefacts.

Strictly speaking, there are sure evidences for Genoan mining just for Khitzma, but it is not likely that this activity was restricted only there, since Medieval mining techniques were extensive worldwide. Moreover, it is very likely that local land masters also took part in this profitable enterprise, by extending it on a wider area.

Another evidence for the success of the silver mining at this time is the fiscal reform, based on newly struck silver coins, made by Queen Rusudan in 1230. As known, at that time in Georgia, like in the whole Middle East, silver coin striking have been discontinued for over 100 years. The reason for this phenomenon is still disputable, but the most obvious and thus likely cause is the exhaustion of the then known silver reserves. The end of this shortage comes with the Genoan silver metallurgy in Abkhazia.

The silver metallurgy in the region stimulated a new revival of the ancient iron metallurgy as well. According to Davidov (1933) in the Codori River catchment there are numerous remnants from iron smelting activity. Such iron metallurgy, accompanying the silver extraction was pretty practical in Dzishra, where the iron mineralization was situated on top of the hill, containing the silver ores. Moreover, it was at grass root position and could be extracted just by surface mining.

An ethnological evidence for the importance of iron smelting in Medieval Abkhazia is the still existing iron cult and the special respect demonstrated to Blacksmiths there (Djanashia, 1960; Chursin, 1927; Chursin, 1957). The Medieval iron metallurgy in Upper Imereti and Racha regions is even better supported by material evidence. In the Upper Imereti iron smelting was organized in the vicinity of the villages Tkibuli, Satziri, Ochzhola and Sormoni. Small hematite and limonite bodies are still available there. In Tkibuli the ores were represented by nests in marls. The extraction has been done from the top of the marls and not getting deep, because of water inflow there. In Satziri the iron ore reserves were larger, but by the end of XIX c. the easily accessible surface layers have been exhausted and further extraction was accompanied by major difficulties.

Iron smelting in Ochzhola was based on the ore transported from Sormoni. This ore was poorer in iron than the one from Satziri, but its extraction used to be easier. The iron metallurgy in the Racha region was organized close to Tzedisi and on a slightly larger scale. Its ore base was a number of small hematite and limonite bodies, often linked by a network of fine veinlets. Its production was used for both internal trade and export to Northern Caucasus. It was used mainly for farming and housekeeping tools.

From the end of XVIII and the beginning of XIX c. the iron inquiry in Georgia showed (as anywhere else) a dramatic growth, connected with the modern technology and defense needs. The primitive, small scale scattered and poorly secured by ore reserves Northern iron metallurgy was unable to satisfy the growing metal needs of the country any more. Georgia definitely needed larger scale, modern and better supported iron metallurgy. This is the reason, why at that time the emphasis was moved back to the South in its Eastern region of Chatakhi.

South Eastern metallurgy of XVIII and XIX centuries

First reports about the revival of iron metallurgy in the Chatakhi region are known from the Georgian geographer and historian Vakhushti Bagrationi. According to him already in 1745 Chatakhi iron was smelted in Sarkineti (Bagrationi, 1976). This enterprise kept working successfully at the times of King Irakli (1744-1798), but at the end of XVIII c. was destroyed by the intervention of the Iranian ruler Aga-Magomed-khan who mercilessly ruined the whole area. According to the Greek mining foreman Anastasius Hadjifatic working there “700 out of the 1700 workers in the area were killed and 836 taken as prisoners of war” (Esadze, 1903).

Iron production from Chatakhi ores received a new start in the middle of XIX century. A new big smelting plant was built here by the German engineer Ernst Libb, who received a big loan from the Georgian national treasury for this enterprise. However, in 1862 he passed away and his widow transferred the management in the hands of the engineers Vitte and Bernuli. Later this year the first amounts of cast iron were produced here. In 1863 the iron production was already 29839 poods (1 pood = 79.6 kg). Another 16685 poods have been cast in 1964, when the factory produced 10000 shells on military order. Future production of the smelting plant included products of high national importance like the national telegraph network, bridge construction elements etc. Nevertheless, the enterprise economy was never stabilized and in 1875 it was finally closed (Khoshtaria-Brosse, net).

One of the main reasons for the failure of the Chatakhi enterprise was the permanent ore shortage, caused in its turn by the underestimation of the importance of the geological exploration works. The only two mine sections of the deposit known at that time were Sarkineti and to some extent Demur-su, discovered (and sufficiently extracted) even by the Neolithic tribes. These reserves were definitely insufficient for the ore base of a big scale enterprise like this. The irony is in the fact, that there are still a number of other mine sections in the immediate vicinity of the factory, with larger reserves and better ore quality, but they were not found on time to support the survival of the enterprise.

One way or another, with the closure of the Chatach smelting plant the South Eastern Georgian metallurgy comes to its end at the brink of XX century. Today the only iron casting smelter in Georgia is the Rustavi enterprise, built 1947 and entirely based on imported ore concentrates from its very beginning.

The paper is devoted to the memory of Dmitrii Ivanovich Kuparadze, whose unpublished materials were widely used here.

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