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Conservation *in situ* of two Germanic Swords of *Spatha* Type

Introduction

In the archaeological research made in Desa (fig. 1), Dolj county, Romania in 2005, there was discovered a complex of weapons made of two *spatha* swords, a point of a spear, a point of a lance, a catcher sheath and a dagger hilt (fig. 2).

The weapons are dated in the IVth p. Chr. century and the cemetery of Roman incineration where there were discovered is from the IInd – IIIrd p. Chr. century. The complex of weapons was discovered at a small distance of the Roman inhabitance, a settlement with military nature near it having a cementery. The way of burrying and laying of the weapons indicates us a weapons storage of the „Aurelian" post withdrawal, in a time where (probably) the cemetery usage was abandoned.

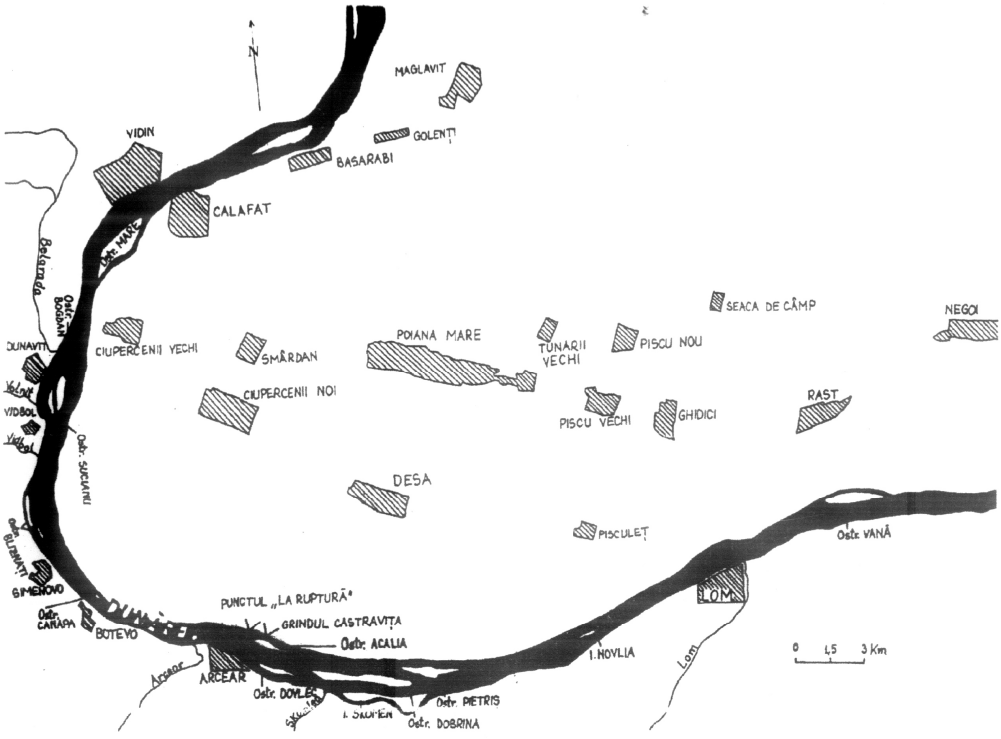


Fig. 1 - Desa archaeological site.

According to the archaeological information it is posible that these pieces might have belonged to some Germanic mercenaries, enrolled in the XIII Legion Gemina, legion which after the „Aurelian" withdrawal was moved from Apullum to Ratiaria, on the South bank of the Danube, *vis-a-vis* of the discovery place of this pieces[1].

Fig. 2 - Photo from the site.

After the context of the discovery we may assume that it's a storage with special from (votive). A very important thing must be mentioned – these weapons discovered entired constitute a unique exemplar in the Romanian field, with a high historical and documentary value.

The pieces discovered in this research – two spears, a sheath catcher from bronze, a lance point, a spear point and a dagger hilt were brought in the Laboratory of Metal restauration, of Oltenia Museum Craiova, Romania, immediately after the discovery.

The paper work presents only two Germanic swords, the rest of the weapons were restaurated and conservated in the Laboratory of metal Restauration, but without having any special problems.

Fig. 3 - "The small sword".

Fig. 4 - "The big sword".

The pieces' presentation

The archaeological complex contains two *spatha* swords, a point of a spear, a point of a lance and a catcher sheath[2]. These objects have nothing to do with the cremation necropolis.

The first sword, called by us "the small sword", has a rod on the handle and two median ribs on the two sides of the blade, which is lenticular in section; the handle is rectangular in section; a fixing rivet can be seen at the end of the handle; the dimensions of the sword are: the length is 87,8 cm, the blade breadth is 5,2 cm, the handle length is 9,8 cm and the weight is 965 g (fig. 3).

The second sword, called by us "the big sword", has a rod on the handle and two median ribs on the two sides of the blade, which is lenticular in section; the handle is pyramidal and rectangular in section; a fixing rivet still exists on the handle; the dimensions of the sword are: the length is 96,7 cm, the blade breadth is 5,6 cm, the handle length is 16,6 cm and the weight is 1240 g. Both swords have marks from the wood sheath on the blade (fig. 4).

[1] GHERGHE, RIDICHE 2006.
[2] GHERGHE, RIDICHE 2006.

Fig. 5 - The point of the lance.

Fig. 6 - The point of the spear.

"The big sword" has the blade blunt on one side, at the middle of it and the blade of "the small sword" is a little bent. For an exactly dating of the two swords, we consider more important the other three objects found in the archaeological complex, namely the point of spear, the point of lance and the catcher sheath, for which we have not found any analogies in the South – East of Europe.

Fig. 7 - The catcher sheath.

The point of the lance has the form of a willow leaf, having the maxim breadth in the central area; the obliquities of the base get narrow progressively; the gloved tube is conical; the dimensions of the point of lance are: the length is 31 cm, the maxim breadth of the blade is 5,7 cm, the diameter of the tube is 2,4 cm, the length of the blade is 20 cm, the length of the gloved tube is 11 cm and the weight is 260 g (fig. 5).

The point of the spear has quadrilateral section of the active side and the gloved tube is conical; the dimensions of the object are: the length is 17,9 cm, the maxim breadth of the blade is 1,1 cm, the diameter of the tube is 1,9 cm, the length of the active part is 12,5 cm, the length of the gloved tube is 5,4 cm and the weight is 92 g (fig. 6).

The catcher sheath is the only object of bronze, the others being of iron. It is the Schwertscheidenbügel zum Einstecken type. The dimensions of the object are: the length is 5,9 cm, the breadth is 0,8 cm, the height is 1,2 cm and the weight is 13 g (fig. 7).

Conservation state

From the point of view of the conservation state the fallowing aspects have been noticed.

- the pieces are covered with a thick stratum of iron corrosion compounds under where wood traces can be seen which come from the sword sheaths;
- the sword lamas are entired, present a robust and permanent metalic middle.

These two aspects give the unicity of these swords because there are rare cases when the entire sword lamas are found, plus there are also kept permanent areas from the archaeological wood of the sheaths, because of this reason the challenge and the responsability of the restaurator is very high.

The type of sole and the laying environment have both traced the iron corrosion compounds (wet sandy sole impregnated with organic cementery substances).

The present knowledge over the corrosion mechanisms and over the from of the iron corrosion, archaeologically speaking is very well studied and understood; this thing gives us the possibility of establishing rigurously an adecvat treatment of the arhaeological pieces found in this situation.

The determination of the physical – chemical nature of the metalic support (iron), the localization of the wood fragments (traces) as well as the preservation methods of these wood fragments and of the originary surface coupled with the cleaning techniques of the extern corrosion products and their establishment constitute the base of the conservation-preservation problems which we want to present.

The conservation and restauration of an archaeological object generally answers to three main objectives[3]:

- the conservation assurance on the long term;
- the relevation of the archaeological information whose material support represents;
- the possibility of the lisibility and its preservation.

The originary surfaces of the sword lamas are masked through the thick storages of compounds coming from the laying environment, where the wood from the sheath is also found, so that on some areas the wood is situated between two corrosion stratum of the same composition and structure.

The oxidated surface of the swords offers the only proofs over the wood structure where the sword sheaths were accomplished and for keeping of these unique confessions (thus, inaccesible) a conservation and a consolidation of the archaeological wood are imposed.

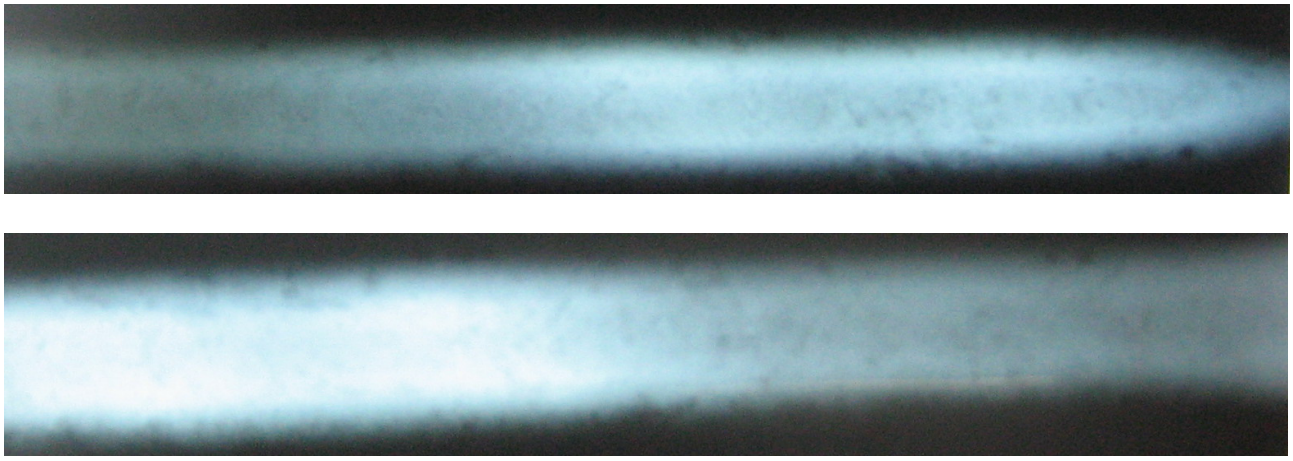
The structure of the corrosion compounds

The iron swords have been analyzed through a RX radiography (figs. 8, 9), stereo-microscopic examination and micro-chemical tests.

The examination of the surfaces with an Olympus microscope emphasized the wood spot very well but also the nature of the external corrosion compounds of the iron.

The wood spot though it is found on a big surface, about 75% of the lamas surfaces it is weakly legible, because it has a colour almost exactly to the rust and it's well settled the bigger rusty stratum, the wood is totally degradated, pulverulent, the wood is totally colour, but it keeps well its form fixed on the iron, over these wood fragments, a lot of sand has been deposited (figs. 10, 11, 12, 13).

[3] AAVV. 1990; 1993.



Figg. 8-9 - RX Radiophy – emphasizes the metal interval structure; the pieces present a consistent metalic middle.

Fig. 10 - The wood traces are strongly fixed in the rust strate of the iron.

Fig. 11 - The wood is porous, pulverized, grinded.

Figg. 12-13 - The biologic degradation caused by mushroom infestation over the wood.

The swords present a generalized corrosion, they are wholly covered with a rust consistent spot (dry form) of grey colour to black (oxydes, sulphites, carbonates or iron sulphates).

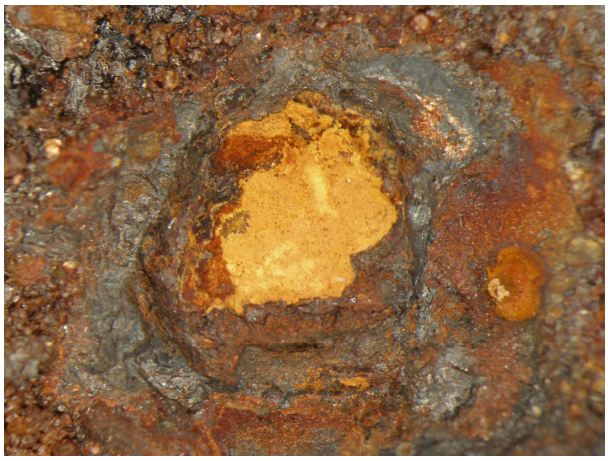
Over this form of corrosion and around the active corrosion of the craters, another form of corrosion was developed, a corrosion under the form of some red-brownish big quantities superposed (hidrated ferric hidrates).

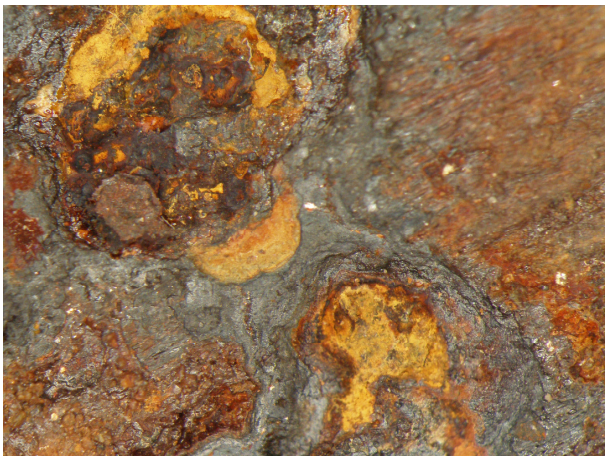
The swords present active corrosion in many points of the surface-yellow chlorides under the form of some deep craters reaching the substituent healty metal, with the supraoxidated edge at the ferrous or black fero-ferrics with metalic glint.

The external corrosion compounds of the iron emphasized on the surfaces are[4]:

- red-brownish compounds (rust) – ferric oxydes (hematites) of Fe_2O_3, or hidrated oxydes, $2Fe_2O_3 \cdot 3H_2O$.

Fig. 14 - Ferrous oxydes of black colour, ferric oxydes (hematites) or hidrated ferric oxydes of red colour – brownish (rust), the fero-ferric oxyde (magnetites) chemical inert of black colour with metalic glistening, ferrous sulphide of black colour.





Figg. 15-16 - Ferrous or hidrated chlorides of white-yellowish to brown

- grey-black compounds which can be: ferric oxyde of FeO, ferrous sulphide of FeS, black ferro-ferric oxyde of Fe_3O_4, with metalic glint (fig. 14) or hidrated ferric oxydes of red colour – brownish (rust), The fero-ferric oxyde (magnetites) chemical inert of black colour with metalic glistening Ferrous sulphide of black colour);
- yellow compounds: ferrous chlorides of $FeCl_2$ or grey-yellow hidratated chlorides of $FeCl_2$ $2H_2O$ (active corrosion) (figs. 15, 16, 17).

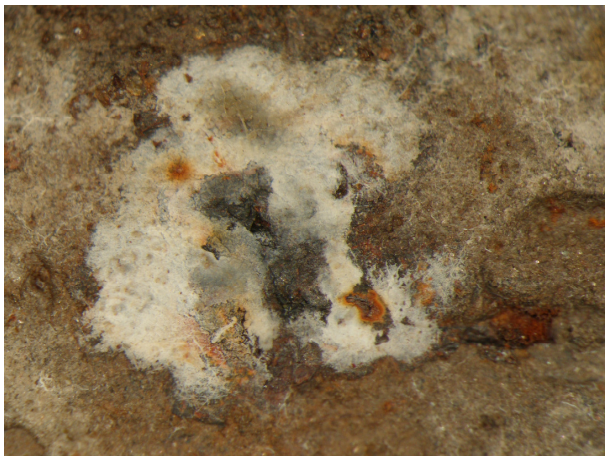


Fig. 17 - Iron carbonates.

[4] SELWYN 1990.

The treatment of the restauration conservation

After the physico-chemical analysis were made, one could see that the swords present a generalized corrosion, they are wholly covered with a consistent rusty spot and with a local active corrosion developed over (in points).

Because the main goal of the treatment is how to keep the wood fragments fixed on the lama (as historical information), but also the elimination of the active corrosion areas (chlorides) formed on the surfaces, it's advisable a restaurating intervention where the consolidation of the pulverent wood can be achieved with a glue agent, the local cleaning of the iron in order to eliminate the active corrosion, the establishing of the iron surfaces and the final conservation of the pieces through the protection covering.

The most indicated treatment in this situation is the keeping establishing of the corrosion stratum (rust) which sustains the wood fibra[5].

In the first phase of the treatment, the only goal was separating the mechanical escape of the originary surface towards the consistent sand deposits through punctual cleaning under the magnifying glass and the stereomicroscope[6].

It's important that the mechanical escape of the originary surface should be run in an omogenous way on a metalic surface of the sword lamas protecting the surfaces with an archaeologic wood.

In the next phase, the goal of the chemical treatment was the controlled pushing way of a level of a iron corrosion compounds till the level of the archaeologic wood for emphasising the fibrous structure of the wood; the chemical treatment was achieved by complexing and pushing the crystalline salts of the iron.

The chemical treatment with complexed agents was achieved by brushing with a solution under the form of a gel which acts selectively (protects the lignine from the mineralized wood and it renders soluble the iron compounds).

In this case we have used a mixture made of a Complexon III solution concentration 5% corrected at a pH acid in suspension of CMC (carboximetilcelulosis). Complexon III (the disodical salt of the diamino tretraacetical etylene acid) represents the cleaning agent of the iron compounds and CMC represents the consolidation agent of the pulverized wood[7].

Pushing away the solubilized chemical compounds of iron (after the gel-rust contact) was achieved by repeated immersions in distilled water.

The chemical cleaning treatment of the iron surface (slow, nice treatment) lasted till emphasising the wood fibra from the entire surface, after that it was stopped, for keeping „in situ" of the wood, thus inaccesible[8].

Starting from this moment, the metalic surface of the iron lamas which presenting the corrosion compounds (which sustain the wooden fibras) had to be pretected through the specific inhibation with the specific reactives; the corrosion inhibitory added in a small quantity in a potential corrosive environment (eg. rust) reduces the errodating speed diminishing the iron tendency to react with this environment.

The complex mechanisms of the inhibition are based mainly either on the formation of a store on the anodic or catodic areas or on an adsorbtion on the same areas.

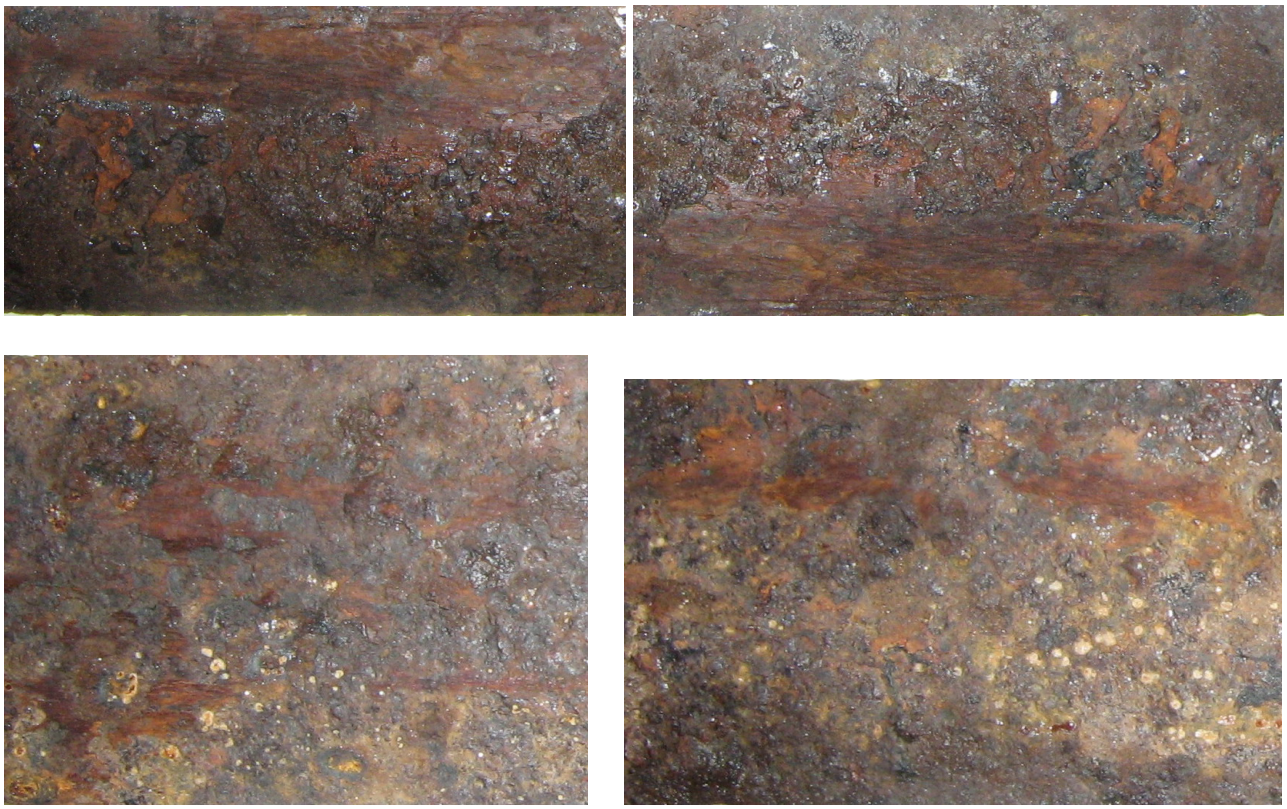
It was operated on the metalic surfaces of the swords by using the anorganic inhibitories for isolating the swords from the environment during the storing/exhibition.

The treatment of the chemical inhibation of the archaeologic iron was achieved by using a nitrite of sodium solution 3% alcoholic (the nitrite of sodium – specific inhibitor of the iron) through repeated immersions in order to obtain a sured protection pelicula[9].

The last applied operation was the impregnating the iron and the fibra archaeologic wood for establishing and consolidation with a acrilic polimere, Paraloid B72 concentration 5% in the toluen solution, through

[5] PLENDERLEITH 1969.
[6] STAMBOLOV 1985.
[7] MOUREY 1998.
[8] PLENDERLEITH 1969.
[9] MOUREY 1998.

immersion under normal circumstances (fig. 18, 19, 20, 21, Details of the conservation and stabilization of the wood fibres from the sheath from the metal surface)[10].



Figg. 18, 19, 20, 21 - Details of the conservation and stabilization of the wood fibres from the sheath from the metal surface.

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Bibliography

AA.VV. 1993. *10-th Triennal Meeting*, ICOM-CC. Washington.
AA.VV.1990. *Conservarea în arheologie. Metode şi practici ale conservării – restaurării vestigiilor arheologice*. Barcelona.
GHERGHE P., RIDICHE FL., 2006. Raport în „*Cronica Cercetărilor Arheologice din România (campania 2005)*". Bucureşti.
MOUREY W., 1998. *Conservarea antichităţilor metalice de la săpătură la muzeu*. Bucureşti.
PIPPIDI D. M. 1976. Dicţionar de istorie veche a României (Paleolitic – sec. X). Bucureşti.
PLENDERLEITH H., 1969. *La Conservation des Antiquites et des Ouvres d'Art*. Paris.
RIEDERER J., 1990. *Restoration and Preservation*, Goethe-Institut. Köln.

[10] MOUREY 1998.

SANDU I., SANDU I. G., DIMA A., 2002. *Restaurarea şi Conservarea obiectelor metalice*. Iaşi.
SELWYN L., 1990. *Metals and corrosion*. Canadian Conservation Institute. Canada.
STAMBOLOV T., 1985, *The Corrosion and Conservation of Metallic Antiquities and Works of Art*. Amsterdam.