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FINALLY, AN ANTIQUE STANDARD OF STEEL SEMI-FINISHED PRODUCTS!

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In ancient metallurgical contexts, steel enjoys a special prestige thanks to its mechanical behaviors: especially its hardness which can be increased by quenching. However, if one relies on discoveries of protohistoric and antique semi-products, steel remains a rare material (Dillmann et al., 2011). Certainly, there are heterogeneous products in which ferritic and steel zones coexist, but the homogeneous masses entirely composed of steel remain relatively exceptional. Yet the study of some antique objects clearly shows that both production and trade of pure steel occur (Berranger et al. 2011, Pagès et al. 2011, Pagès 2014, Berranger et al. 2017, Dillmann et al. 2017). Moreover, ancient authors such as Pliny the Elder distinguish the materials using the terms heterogeneous iron and pure steel.

The study of two antique semi-products, with identical morphology and structure, provides new perspectives on this question. Fully steeled to 0.7 / 0.9% carbon, they are bars 15 cm long and 3 x 1.5 cm section. They have been discovered in the Roman military camp Strebersdorf (Burgenland, Autriche, Groh 2009) and in the late-antiquity fortified hilltop city of Roc de Pampelune (Argelliers, Hérault, France, Pagès et al. 2005). More than 5 centuries and 1500 km separate these similar discoveries. How to interpret this? That's the question we want to answer by using the results of metallographic and LA-ICP-MS analyses and confronting them with the facts recounted by the ancient authors as Pliny the Elder.

References

- [1] BERRANGER M., FLUZIN P., 2011, « From raw iron to semi-product: quality and circulation of materials during the Iron Age in France », *Archaeometry*, 54, p. 664-684.
- [2] BERRANGER M., BAUVAIS S., BOUKEZZOULA M., LEROY S., DISSER A., VEGA E., AUBERT M., DILLMANN P., FLUZIN P., 2017, Analyse technologique, étude de provenance et datation par le radiocarbone du dépôt de demi-produits ferreux de Durrenentzen (Haut-Rhin, France) : une vision renouvelée de l'économie du fer au premier âge du Fer, *ArcheoSciences*, 41/1, p. 45-67.
- [3] DILLMANN P., PEREZ L., VERNA C. (DIR.), 2011, L'acier en Europe avant Bessemer. Actes du colloque international (Paris, 2005), Toulouse, CNRS/Université de Toulouse-Le-Mirail (coll. Méridiennes, Série « Histoire et Techniques »).
- [4] DILLMANN P., SCHWAB R., BAUVAIS S., BRAUNS M., DISSER A., LEROY S., GASSMANN G., FLUZIN P., 2017, « Circulation of iron products in the North-Alpine area during the end of the first Iron Age (6th-5th c. BC): A combination of chemical and isotopic approaches », *Journal of Archaeological Science*, 87, p. 108-124.
- [5] Groh S., 2009 : « Neue Forschungen an der Bernsteinstraße in Nordwestpannonien – Die römischen Militärlager und der Vicus von Strebersdorf und Frankenau/Frankenava (Mittelburgenland, Österreich) », in Biró S. (dir.), *Ex officina ... Festschrift Dénes Gabler*, Győr, Mursella, p. 175-188.
- [6] PAGÈS G., DILLMANN P., FLUZIN P., LONG L., 2011, A study of the Roman iron bars of Saintes-Maries-de-la-Mer (Bouches-du-Rhône, France). A proposal for a comprehensive metallographic approach *Journal of Archaeological Science*, 38, p. 1234-1252.
- [7] PAGÈS G., 2014, Productions, commerces et consommation du fer dans le sud de la Gaule de la Protohistoire à la domination romaine, *Gallia*, 71/2, p. 47-67.
- [8] PAGÈS G., SCHNEIDER L., FLUZIN P., 2005, Le travail du fer dans l'établissement perché tardo-antique du Roc de Pampelune (Argelliers, Hérault) : l'apport des analyses métallographiques, *ArcheoSciences, Revue d'Archéométrie*, 29, p. 107-116.