

THE EARLIEST EUROPEAN PLASTER PYROTECHNOLOGY. THE RED FLOORS OF LEPENSKI VIR

JOHN G. NANDRIS

The trapezoidal houses of Lepenski Vir I and II, whose marked standardisation is one of the features which suggest them as belonging to a K-strategy Climax society, have floors made of a hard red man-made substance. This is very well-adapted for the flooring of houses on the sandy beach at the site, giving been spread like plaster or cement. A small sample was examined at the Institute of Archaeology with the help of Mr. Rod Clough, to whom I am grateful for the technical observations contained herein.

Plasters are composed of gypsum or limestone, ground up, heated and then rehydrated to produce a compound which hardens after spreading. In the case of limestone this heating is called calcining and has the effect of breaking down the carbonate into lime. Temperatures of upwards of 600 deg. C. are necessary for the dissociation of the carbonate, unless the material is very finely ground, which at Lepenski Vir it is not. *Cement* represents a higher-temperature process combining the lime with the clay minerals alumina and silica, with hydrated silicates as the final product.

The red floors have in some cases been cut through. For example there are extended burials, at the rear of the house behind the hearth, which (—like the burials extended with their feet towards the fire around the hearths of some of the Schela sites on the Romanian shore of the Gorges, —) seem to replicate the sleeping positions of the living within the house. In other cases a new layer of red flooring has been spread, or that of a new house overlaid near the position of the old one. It also forms a neat matrix for the stones of the hearths, the rubbing-stones and the A-features beside the hearths, and for the boulder art which is set into it in certain of the houses.

The red flooring comes under the broad heading of Plaster Technology, which was a development associated with the Neolithic mode of behaviour just as remarkable as that of ceramic technology. It is prominent during the PPN, with developments of plaster flooring, wall plasters, encrusted skull

with shell eyes and painted features. An associated development is the thick-walled white « plaster wares » of such sites as Ramad or Tell Labwe in the Beq'aa, Jericho, Asikli Hüyük and Cayönü in Anatolia, or their further development at Byblos, where dark-faced burnished wares are given an outer coating of the same material, so that they come to look like thick-walled plaster vessels. The techniques date to c. 5900 b.c. in level II of Ramad, and from a similar date at Bouqras on the Euphrates (Nandris 1969: *Early Neothermal Sites in the Near East and Anatolia. Memoria Antiquitatis* (Piatra Neamt, Romania) Vol. I; 11-66). The so-called « kaolin wares » of Achilleon Ia in Thessaly (see Gourdin and Kingery, *Journal of Field Archaeology*, Vol. 2, 1975: 133-50) date to the 55th century b.c., if we can trust the radiocarbon dates for the site. There would seem to be a prestige element involved, or at least one which is not wholly utilitarian. This is evident in the plaster skull cult, but even the plaster wares of Labwe must imitate white stone vessels, which demanded more labour and rarer resources. At Byblos thick plaster white ware is added to the surface of ordinary dark-faced burnished ware. This treatment emphasises the social component of the technology, since it is clear that there is an intention to make one thing resemble something else, presumably more desirable or prestigious. This whole plaster technology along with its social implications (which are the inevitable accompaniment of technological innovation) has been unjustly neglected as a topic of research. There are many instances of « wall plaster », often decorated, in the south-east European Neolithic; these are not plaster in the true sense of involving pyrotechnology but are daub or pise. The material of the red floors at Lepenski Vir is one more indication of the daring and uniqueness of the site.

The question arises as to its precise nature and definition, and the technical knowledge which it presupposes. This is not necessarily very complex, but the employment of red flooring at the side

need not be viewed solely as a technical response to sandy foundations, which would have surely led to its being used elsewhere. Its social significance may be just as important.

The red floors are made of a resistant fine-grained material, with some quartz inclusions and a hardness of c. 3-4 on Moh's scale. The powder X-ray diffraction pattern indicated that calcite (CaCO_3) was the primary constituent, with quartz and goethite in minor quantities, the latter being responsible for the red colouration. Differential Thermal Analysis (DTA) was also carried out showing the broad carbonate dissociation peak and thus confirming the diffraction analysis. The same colouration appears in the limestones surrounding Lepenski Vir, and there is no reason to suppose that this is anything but a use of raw materials collected and treated locally. They could have been ground up using the stone mauls which are found on the site. The calcination was possibly carried out prior to grinding, making the limestone more friable and easier to grind. A heating process is at any rate certainly involved, and it must have necessitated temperatures of at least 600 deg. C., which would convert the CaCO_3 into lime (CaO). Calcining the raw material is an essential step in the process, since the mixture of the ground-up raw material alone with water would be unlikely to result in such a compact plaster which has survived archaeologically so well. Its hardness is the result of expansion during the formation of the hydroxide and then the carbonate.

Something which must be borne in mind is that the volume of material produced, to cover floors the area of the Lepenski Vir houses to a depth of anything up to ten or fifteen centimetres, must be measured in tons, as could readily be calculated from the site records. A primitive kiln would certainly facilitate production on this scale, as well as the production of higher temperatures with an updraught. A site for such a kiln could easily

have been made on the hillsides behind Lepenski Vir, but there is no evidence at all that this was done. It is also a matter for speculation at present whether the lime was then slaked; but it seems likely that it was mixed with water and applied directly to the floor areas. The floors certainly seem to have been spread onto the sandy beach which forms their base. The lime would then be converted to the hydroxide Ca(OH)_2 which would react with the carbon dioxide in the atmosphere to form the calcitic plaster found at the site.

The red floors at Lepenski Vir are at present the earliest European example of plaster pyrotechnology, and remain rather isolated. They are quite distinct from the use of « wall plaster » in neolithic houses, since those did not involve the use of fire. In the earliest levels of Lepenski Vir this antedates the use of pottery in south-east Europe. So too perhaps did the firing of clay sling-shot and figurines in the « Pre-Pottery Neolithic » of Thessaly, or (with a much higher degree of certainty) the firing of clay figurines at the Gravettian site of Dolni Vestonice. Both the plaster and the ceramic technologies were examples of the use of fire to transmute commonly available raw materials into something of permanent utility, and as examples of the most advanced technology of an age were in addition the vehicles for social messages. The pottery of the FTN bore decoration which indicated regionalism within that unity, and the number of vessels in a house may have indicated something of the status of the owner in the society. The houses at Lepenski Vir are themselves of special importance, and it indicates something of the status of the site that it warranted the investment of so much care in their construction.

*University College
Institute of Archaeology
University of London*