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Assessing the effect of modern ploughing practices on archaeological remains by combining geophysical surveys and systematic metal detecting

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Introduction

It is a well-known fact that modern ploughing regimes can be highly detrimental to archaeological sites (Ammerman 1985, Haldenby and Richards 2010). Regular deep-ploughing in order to replenish the topsoil truncates the underlying archaeological features, whilst simultaneously bringing artefacts to the surface, artefacts that are commonly found by metal detectorists. Without further information about their original context, however, the scientific value of the finds is often limited to their physical and aesthetic properties rather than their cultural significance. Through the example below, we argue that by using geophysical methods in conjunction with systematic metal detecting, we may not only increase our knowledge of the site itself, but also be able to further our understanding of how, and to what extent, archaeological sites are damaged by the plough.

Background

In 2014 a group of experienced metal detectorists recovered a number of unusual artefacts near the farm Sem in Øvre Eiker municipality in the south-east of Norway (Fig. 1), a municipality best known in archaeological terms for the spectacular 9th century *Hoen hoard*, unearthed in 1834 near Hokksund some three kilometres to the north (Fuglesang and Wilson 2006).

Amongst the 323 artefacts recovered in 2014 were lead weights, fittings in the insular style and Arabic coin fragments, as well as ingots, crucible fragments and slag, suggestive of a site engaged both in local fine smithing and international trade. Such sites are a rarity in the Norwegian archaeological record, and in order to explore the finds' origins, a geophysical survey was carried out the following year. This employed a 400 MHz 16-channel MALÅ Imaging Radar Array GPR system (Trinks et al. 2010), with a high spatial sampling resolution of 4 x 10,5 cm - resampled to 10 x 10 cm. 11 hectares were surveyed over the course of three days, revealing traces of a production and trading site, a mound cemetery and an extensive settlement site

Figure 1: a) The location of Sem in Øvre Eiker, Buskerud, Norway (Base map: The Norwegian Mapping Authority, 2017); b) The 9th century hoard found at Hoen near Hokksund, three kilometres north of Sem (© 2017 Museum of Cultural History, University of Oslo/CC BY-SA 4.0); c) A selection of artefacts recovered during the metal detecting campaigns of 2014 and 2016 (© Bjørn Johnsen, Buskerud County Administration).

with a broad time span. A second, more systematic metal detecting campaign was then mounted in 2016, in order to extract more information from the site. Although still ongoing, the analyses of the metal detecting finds have already revealed interesting distribution patterns that we believe warrant further investigation.

Preliminary Results

The GPR surveys revealed a complex settlement extending across the survey area (Fig. 2). In the northern part, a post-built structure and sundry postholes with no clear organisation can be seen in connection with the Medieval and post-Medieval activity on the site. Of particular interest is a large, angular anomaly which continues into the fields to the north, representing gardens of a 17th century royal estate. In the eastern part of the survey area anomalies forming at least 10 circular structures, measuring some 7 – 18 m in diameter, clearly representing ring ditches of ploughed out burial mounds. In the southern part of the field the GPR surveys yielded evidence for a well-defined area consisting of numerous pits of varying size and shape. The larger of these are thought to represent pit-houses used in connection with fine smithing, whereas the smaller pit-like features may represent hearths or refuse pits associated with production.

Combining the information from the metal detecting surveys with the GPR data shows that the distribution of metal finds corresponds well with the position of the archaeological features detected by GPR, with distinct clusters over the production and trading site as well as the mound cemetery (Fig. 3). In this preliminary study we have specifically analysed the spatial distribution of Iron Age metal ob-

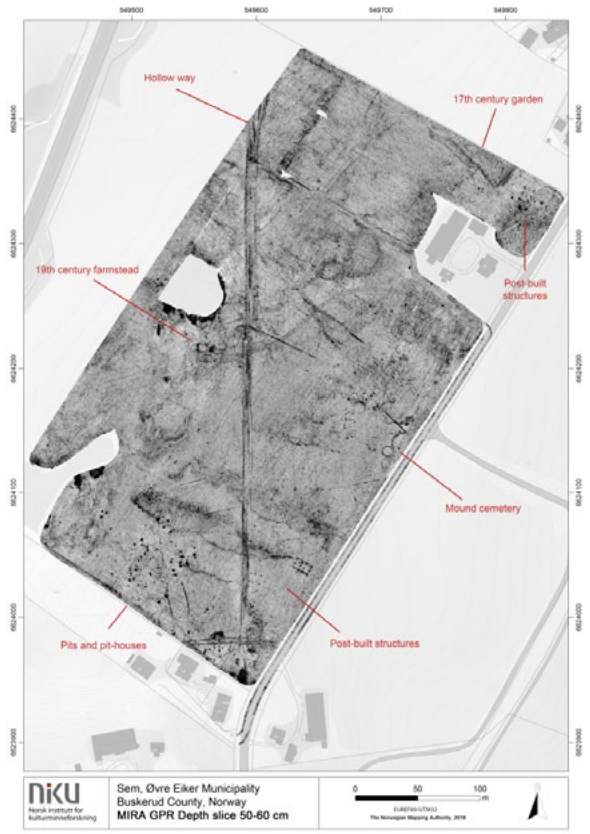

Figure 2: Depth slice 50-60 from Sem, showing a complex settlement area comprising post built houses, production pits, pit houses and several burial mounds (Base map: The Norwegian Mapping Authority, 2017).

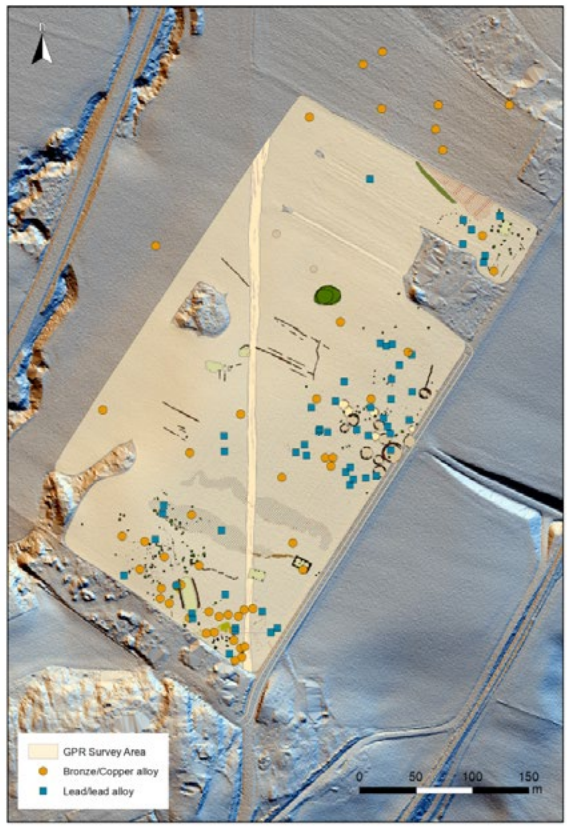

Figure 3: Distribution of finds recovered by systematic metal detecting combined with interpretations of the GPR datasets (LiDAR data: The Norwegian Mapping Authority, 2017).

jects related to trade and production, in relation to features interpreted as contemporaneous working pits and waste pits. Assuming that there is a correlation between the metal objects and the features detected by GPR, there seems to be considerable lateral movement of objects in the plough soil. By measuring the distance between every single feature and the nearest find we can assert that, at least in the southernmost activity zone, the majority of finds is located 4 – 7 m away from the nearest feature. This is surprising given that the metal detecting was carried out shortly after the autumn ploughing, and clearly indicates that even a single ploughing event has caused significant damage to the underlying archaeology. Further preliminary analyses of the data also indicate distinct distribution patterns in the type and material of the metal finds. For example, there is a clear correlation between the distribution of lead based finds and the mound cemetery, whereas copper alloy finds are largely concentrated around the production and trading zone. The ongoing analysis and studies of the finds will hopefully produce important information as to the original function, date and composition of each find, allowing the objects to be sourced to their original contexts. This, we believe, will make it possible to assess the spatial movement of the finds and to potentially quantify the effect of the current agricultural regime on the archaeological features, so that preventive measures may be introduced. Further analyses of the finds will of course also enhance the dating of the site, and will refine its chronological, functional and spatial development, while simultaneously providing suitable targets for future, limited excavations and geophysical surveys.

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