BOURNEMOUTH UNIVERSITY AND DORSET AONB

Bronkham Hill and Clandon Hill:

An archaeo-geophysical investigation 2008-11

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The South Dorset Ridgeway Heritage Project was a Heritage Lottery funded programme designed to raise awareness at both local and national levels of this diverse and important landscape. Within its aims and objectives was the intention to develop research involving the local community particularly with regard to one of the most enduring aspects of the Ridgeway's Heritage – The Round Barrow Cemeteries that dominate the skyline.

The following summary report is intended for non-specialist consumption and outlines the results of three seasons of surveys carried out between 2008 and 2011 by the authors and students from Bournemouth University and a team of dedicated volunteers from the local community.

Cover illustration shows a high resolution Differential Global Positioning Survey being undertaken at Clandon Barrow by Harry Manley in 2011.

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Introduction

Probably the most enduring landscape features of the South Dorset Ridgeway, particularly with regard to the great antiquity of many of those still visible today and that by definition have subsequently managed to survive the ravages of time, are the round mounds that frequently dot the down and heath skyline between Osmington in the east and Martin Down in the west. Numbering in excess of 2200 examples in Dorset as a whole (Grinsell, 1982, 2) with a recent survey identifying 691 in the area of the South Dorset Ridgeway (Wessex Archaeology, 2011), these mounds represent the most visible residual artefacts of some of our most distant ancestors, who occupied this landscape between circa. 2300BC–1700BC. The mounds are collectively referred to as Round Barrows and represent for the most part the funerary monuments in which our ancestors were interred following their deaths during a period which we refer to as the Bronze Age (although some may date to the end of the preceding Neolithic period) .

One could be forgiven for thinking that our collective knowledge as to the purpose and evolution of these monuments is well developed, considering the trail of academic and popular literature that has built up concerning over the last century or so. Important studies both at a national level (Ashbee, 1960; Kinnes, 1979; Woodward,A., 2000) and more locally (Drew, C.D & Piggott, S.P. 1936; Grinsell, L.V. 1959 & 1982; Woodward, A. & Woodward,P. 1996) amongst many others from similar monuments in other regions of the UK, have painted a picture of a monument type with a well structured morphological and chronological sequence.

The available data accumulated from past investigations presents a mirror into which the investigator can peer into the funerary and cultural activities of communities that occupied this part of Dorset (and by inference elsewhere) in this very formative period of our past. However, as time passes and research into the monuments progresses it is clear that many of the monuments exhibit increasingly diverse characteristics that suggest that simply classifying them as places for the disposal of the dead falls short of the mark and somehow incomplete.

The available evidence also provides valuable insights into communities which were emerging into established and settled social and political units that were increasingly developing economic links with continental Europe, which may have led to some members of the community attaining a level of power and status that qualified them to be honoured after their death by interment in one of such mounds. Whilst the numbers of mounds of this type are relatively high they do not represent an accurate reflection of the sum of the contemporary population and clearly were reserved for a few.

However, when one examines the evidence more closely we discover that our extrapolated interpretations are based on a very simplistic understanding of data that can be frequently contradictory and hugely incomplete. Equally the data recovered from numerous surveys and excavations undertaken in the last 150 years shows huge variability in nature that can only hint at what must represent wide diversity in cultural traits, localised style and habits, and of course spatial and chronological variants in ritual and religious beliefs and practices.

It is against this background that the work contained in this report should be viewed. Any investigative work on the barrows of the South Dorset Ridgeway has to seen in the wider context of establishing a larger data set to better understand the monuments as a whole as well as providing much needed data on specific examples such as those described in the following pages.

In the beginning

During the project design phase for this multi-layered community investigation into the heritage of the landscape, it was mooted to the projects steering committee in 2007 that it would be possible to combine some research into the archaeology of the resident population of Round barrows by the careful integration of professionals, students and volunteers from the local community. The professional and academic lead for the investigation was provided by John Gale, Senior Lecturer in Archaeology, School of Applied Sciences, Bournemouth University who drew up a research design which initially suggested a programme of geophysical investigation at two possible barrow cemeteries, Bronkham Hill (Fig 1), and Winterbourne Poor Lot. The surveys would be undertaken by a small number of undergraduates from Bournemouth University as part of their studies in concert with volunteers from the local community.

Fig 1. Bronkham Hill (pictured from Black Down to the north-west).

A previous campaign of survey incorporating professionals and volunteers had recently been undertaken by Hazel Riley of English Heritage (Riley, H.2008) focussing on the Neolithic Long Barrows of the Ridgeway. This survey was in part organised through the offices of the Dorset AONB (Area of Outstanding Natural Beauty) and thus the embryo of a highly motivated and willing team of amateurs was in place. To facilitate a better quality of survey and to ensure that volunteers gained more than just the data gathering experience a 'geophysical training day' was held at Bournemouth University in the early autumn of 2008 to give those volunteers who wanted it some background to the 'physics' of geophysics and also to provide context and essential skills prior to undertaking the survey.

Essentially three campaigns of survey were undertaken between 2008 and 2010 chiefly in the late winter/early spring periods, when the grass and undergrowth at the chosen sites was sufficiently low so as not to impede the data gathering process. A final data checking exercise was also completed in the field in July 2011 by the authors of this report prior to final analysis and report preparation.

It was not logistically possible to schedule the student and volunteer surveys together and consequently these were undertaken at different days within the same seasonal campaigns.

The sampled sites (Fig 3)

As indicated above the original research design identified the Round Barrow cemeteries at Bronkham Hill and Winterbourne Poor Lot as those to be worthy of sampling for investigation. One of the primary aims of the research was to determine through geophysical means the likelihood of barrow loss through erosion or human intervention. Recent work by John Gale in east Dorset (Gale , 2007. 100-2) has identified that the population of barrow cemeteries can be significantly short of the figures quoted in such archaeological databases as the local Historical Environmental Record (HER) and the National Monuments Record (NMR) or even qualified through aerial photography transcription.

The transcription of aerial photographs that contain the tell-tale soil and crop marks of buried archaeological remains and structures has identified the presence of the residual remains of barrows (ring ditches) no longer visible at ground level. However, the phenomenon is susceptible to the vagaries of the British climate and of course the coincidence of having photographic aerial sorties at the right time is not an exact science. Even so the numbers of barrows identified in this way has dramatically increased the overall numbers of barrows in the British landscape. The numbers of round barrows recorded in Dorset by Grinsell in his 1950's survey was around 1800 (Grinsell, 1959, 9). By the publication of his supplement to this work in 1982 this figure had risen to over 2200, mostly identified from aerial photographs (Grinsell, 1982, 1-2).

The ring ditches which are frequently all that remain of eroded and ploughed-out barrows are not only identifiable as features on aerial photographs but are also at least potentially detectable through the judicious application of geophysical techniques. Whilst a number of techniques within the armoury of geophysics are capable of also detecting these ring-ditches, such negative intrusions in the localised pedology/geology are frequently identified through magnetometry and specifically through the use of a fluxgate gradiometer (Fig 2).

At Bronkham Hill (figs 1 &3) The round barrows are generally quite widely spaced and the presence of additional barrows, perhaps originally of relatively small dimensions might be expected. The Ridgeway at this point is topped by the sand and gravel of the Bagshot Beds (Perkins, 1977, 173) which are nutrient poor and have consequently are unproductive for arable farming without the introduction of fertilisers. Accordingly the landscape and archaeological features it may contain might reasonably be expected to have suffered less from ploughing over time.

Fig 2. A Volunteer undertaking geophysical survey at Bronkham Hill in 2008 using a Geoscan FM36 Fuxgate Gradiometer

An area of pasture in the centre of the Bronkham group was identified as the most suitable for investigation centred on NGR 36250/08700. The field contained a number of round barrows ranging from the large double bermed and ditched Bell (NGR 36270/08687) - overall diameter 58m to the more diminutive Bowl (NGR 36264/08692)-

overall diameter 14m. A secondary aim of the geophysical survey was to determine the presence/absence of ditches in extant barrows (such as the latter described above) where there is no topographical evidence to confirm their existence.

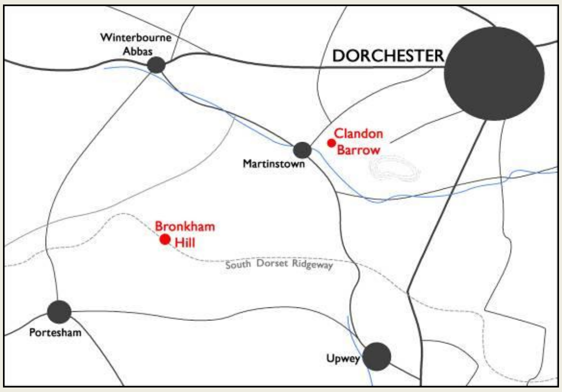

Fig 3 General location of the two survey sites: Bronkham Hill and Clandon Hill (Barrow).

Following the first season of survey the decision to sample Clandon Hill rather than the previously considered barrow cemetery at Winterbourne Poor Lot was the result of discussions between John Gale and Peter Woodward, the then Curator of Archaeology at Dorset County Museum. The results of the Bronkham Hill survey combined with the research potential at Clandon contrived to suggest that a relatively small survey using both the staff resourcing available and the equipment from Bournemouth University would address fundamental interpretational and investigative issues surrounding Clandon Barrow one of two observable barrows that occupy the hilltop at Clandon Hill (NGR 36564/08900).

Clandon Hill (fig 5) is a small ridge of chalk lying to the north of the main concentration of barrows typified by the Bronkham group. There is evidence that once again the hill is topped off with a layer of sand and gravel which is likely to similar to that identified at Bronkham but is presumably a thinner deposit at this elevation.

Clandon barrow itself is a large imposing barrow notable due its excavation by Edward Cunnington in 1882 (Fig 4) which revealed some exceptional objects that were later incorporated into a study of similar artefacts from other barrows in Wessex undertaken by Professor Stuart Piggott in the 1930's that led the identification of the so called 'Wessex Culture' (Piggott, 1938).

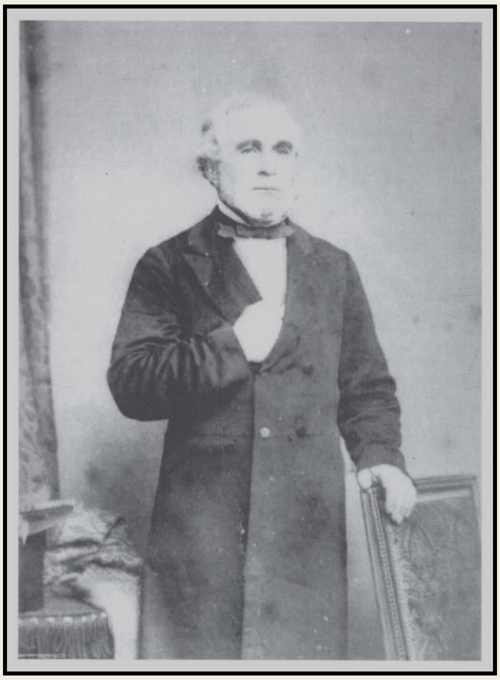

Fig 4 Edward Cunnington (1825-1916) The excavator of Clandon Barrow.

Cunnington's excavation was never published within his own lifetime but his papers were drawn together in the 1930's by the then curator of the Dorset County Museum, Charles Drew who in association with Stuart Piggott (who provided a description and discussion of the principal finds) published an account of the Clandon excavation alongside that of another Ridgeway barrow in 1936 (Drew & Piggott, 1936).

In the description of the excavations it is clear that the excavation of Clandon (via the top of the barrow – typical for the period) only penetrated to a depth of approximately 3 metres (about half of the current height of the barrow). It is likely therefore that none of the material recovered related to the primary deposit which would normally be located at the base of the mound or within a pit dug into the old ground surface which was ultimately buried by the raising of the mound.

Fig 5 Aerial photograph of Clandon Hill from the east with Clandon Barrow and its less well defined partner barrow both clearly visible in the centre of the image.

Cunnington's account also describes various features that he encountered within the structure of the mound (Fig 6) that subsequently could be interpreted as indicating that the barrow mound constitutes more than one phase of construction, which would at least go some way to explaining the location and context of the exceptional artefacts found during his excavation.

It was decided that short of excavation the only way to shed some light on the deposits encountered by Cunnington, and thus attempt to confirm the hypothesis of a two or more phased structural sequence for the barrows construction was through the application of geophysical means.

Depth studies in Geophysical prospection are primarily achieved through the application of two methods: Electrical Resistance Tomography (ERT) or Ground Penetrating Radar (GPR). Both methods were deployed at Clandon in 2009 under the direction of Paul Cheetham and the initial findings are discussed below.

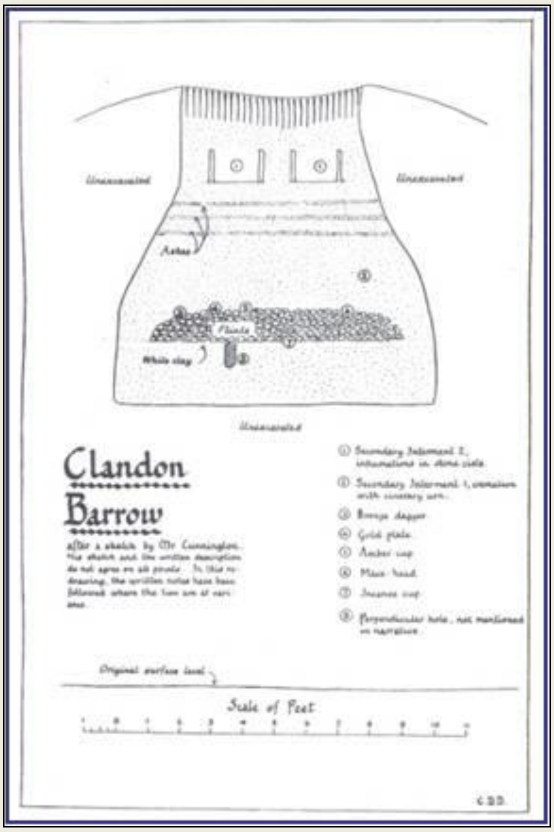

Fig 6 Drew and Piggott's interpretation of Cunnington's sketch of a section through his 1882 excavation of Clandon Barrow(1936).

In addition to looking at depth studies through the profile of the mound a detailed topographic survey of the barrow was completed (Fig 14) via a Differential Global Positioning System (DGPS) survey. This was undertaken to produce an accurate Digital Terrain Model (DTM) of the mound to cross correlate with the Geophysics results and also to create a permanent record of the mound.

As with Bronkham, geophysical area surveys were undertaken concentrating on the use of Earth Resistivity which after initial testing appeared to be providing the best results from the ground conditions at the time. At Clandon this was designed to investigate the possible presence of archaeological anomalies in the immediate vicinity of the barrow that may relate to its construction and/or subsequent use. The apparent lack of an observable ditch surrounding the barrow that would have acted as a source for the mound might be expected to be detectable if present.

Survey methodologies and results

Bronkham Hill (Fig7)

A total of 15,900 sq metres (1.59 ha or 3.93 acres) was surveyed with two Geoscan FM36 Fluxgate Gradiometers during two periods of survey during February-March and April-May 2008. The site was gridded out in 10m x 10m units and readings were logged manually at a resolution of 1m x 0.5m and at 1nT. The data was subsequently downloaded and processed in Archaeosurveyor v2.

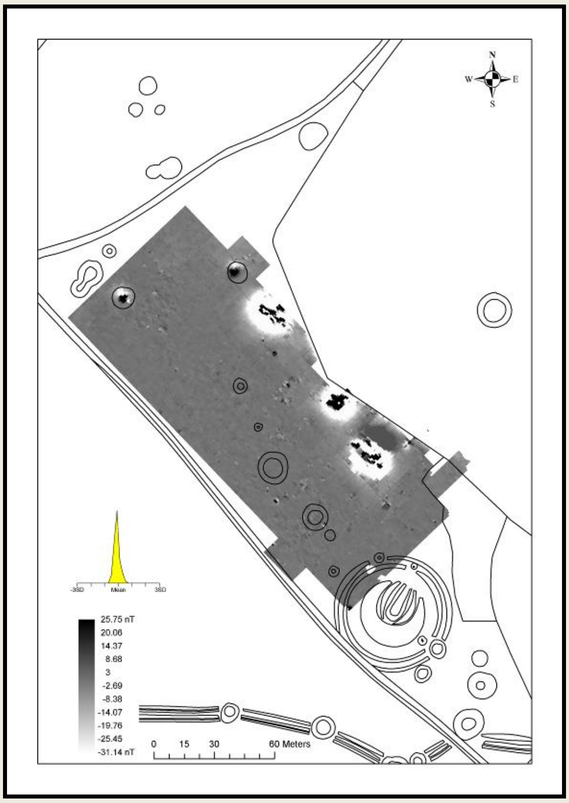

Fig 7 Grey scale plot of geo-referenced gradiometer survey at Bronkham Hill 2008.

Figure 7 is a geo-referenced grey scale image of the area surveyed overlain by the field boundaries and outlines of the barrows observable in the landscape. Also circled on the image and intermixed with the barrows are sink-holes (also known as Dolines) which a geological feature common in kaarst landscapes where the overlying capping of gravels collapses into solution holes eroding in the underlying chalk.

The results of the survey can be summarised thus:

- The identification of negative archaeological features (i.e. ditches) which would commonly occur surrounding round barrows which would have originally acted as quarries for the accompanying mound material could not be determined. There was no identifiable response from the magnetometer even where a partially unfilled barrow ditch (the large Bell barrow at the southern end of the surveyed area) is present (see Discussion and Conclusions below).
- The mounds of likely barrows showing as double circles in Fig 7 similarly show no difference to background levels.
- The presence of Dolines were confirmed to the north and east of the survey with the three to the eastern limit of the surveyed area showing very high magnetic activity.

Fig 8 Geophysical surveying underway on Bronkham Hill in 2008. Volunteers getting to grips with a Geoscan FM36 Fluxgate Gradiometer and the laying out of 'washing lines' to grid the data. Here the team is surveying over one of the partially silted-up Dolines (sink-holes) that occur at the site.

Clandon Barrow (Fig 9)

The geophysical surveys at Clandon took place during February 2009, April 2009 and again in February 2010, Topographical survey was undertaken in 2010 with some additional data gathering in June 2011.

The area around Clandon Barrow was initially scanned with both Earth Resistivity and Fluxgate Gradiometer instruments to assess for suitability and it became quickly apparent that there was little variation in the magnetic response from the Gradiometer. Consequently the focus was placed on an area survey around the barrow with a Geoscan RM15 Earth Resistivity Meter where significant variation in signal was observed during initial scanning.

An area of approximately 8800 sq metres (2.17 acres or 0.88 ha), was gridded out in 20m x 20m units (Figs 9 & 15). The survey area was defined specifically to surrounding the barrow but with a spatial bias to the south to accommodate the ridge top and the level ground rather than the steep slope lying almost immediately to the north of the barrow.

Fig 9 The location of the area investigated by Earth Resistivity (Geoscan RM15 Earth Resistivity Meter).

A standard Twin Probe Array was selected for the earth Resistivity survey with a survey resolution of 1m x 1m. The data was subsequently downloaded and processed in Archaeosurveyor v2. The analyses of the findings are presented below in the following section.

Fig 10 The area Earth Resistivity survey in progress during 2009.

The primary objective for the surveys at Clandon were designed to address the structural composition of the barrow itself as discussed above with regard to the application of ERT and GPR.

To undertake such survey work a series of Transects were surveyed over the main body of the mound. In all four transects for the GPR surveys were plotted over the mound with a single ERT transect. This report will describe and summarise the results from a single GPR traverse (GPR Transect 1) and the ERT traverse (ERT Transect). The data from the other GPR traverses are still being analysed and will be reported in a subsequent technical paper.

Continuous readings were taken across the GPR Traverse with a Mala RAMAC X3M system using 250 and 500MHz antennas. The data was downloaded into GPR-Slice software and the results from GPR traverse 1 are further discussed in the following section.

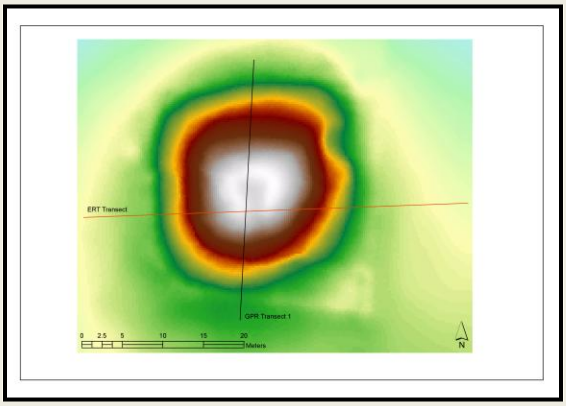

Fig 11 A shaded contour model of Clandon Barrow with geophysical survey transects superimposed (Red – ERT; Black-GPR).

The ERT system involved the placement of probes (electrodes) across the traverse (Figs 12 & 13) at a regular interval (approximately 40cms). Electrical currents are then passed into the ground via the probes and the resistance to flow of these currents is measured. The system used allows for a complex switching arrangement between probes at differing separations along the line (and cumulatively around central points) that can be configured as required. The configurations are commonly called arrays and their response to features or anomalies can be very different. In ERT the Wenner, Double Dipole and Pole to Pole arrays are all commonly used but the results at Clandon were most effectively illustrated in a pseudosection (Fig 16) compiled from the Pole to Pole and are analysed and interpreted in the following section.

Fig 12. Paul Cheetham operating the Electrical Resistance Tomography (ERT) meter at Clandon Barrow in 2009.

Discussion and Conclusions

Bronkham Hill

The results from the Gradiometer survey at Bronkham are best summarised as being surprising for what they didn't show rather than what they did.

It was expected that the identifiable smaller barrows examined in the survey area (Fig 7) would have evidence for the presence of ditches that would have acted as quarries for their respective mounds. Consequently it might also have been expected that other smaller barrows or those that create a lighter footprint may have survived in the form of residual ditches between those surviving as earthworks today.

Fig 13 The ERT transect (indicated by the yellow cabling) with a volunteer (Hazel Dunning) gathering elevation data for the line of the transect.

That in neither case was there any evidence to suggest the presence of ditches is perhaps initially surprising. The lack of a positive increase in the magnetic response from the partially surveyed ditch of the large double-bermed bell at the south-eastern limit of the surveyed area (Fig 7) would seem to suggest that any ditches present are not being filled in during the sedimentary process over time with magnetically enhanced deposits.

To test the test the potential of the soils found at Bronkham for magnetic enhancement soils from the site (extracted from non-scheduled areas) were analysed at Bournemouth University (Gale, 2009. 202). The samples from both A and B horizon soils both indicated that the soils had the potential for magnetic enhancement when heated. That such enhancement appears not to have taken place would therefore seem to suggest that following the interments at the barrows and subsequent abandonment of use of the landscape for burial purposes the hill appears to have been little used at least while the ditches of the double-bermed barrow was silting up.

It is still a matter of conjecture as to likely presence of ditches around the smaller barrows. It is certainly feasible that the builders of them found it easier to scrape up soil for the mounds from the general area rather than create a surrounding ditch. If this is the case then clearly the presence of a ditch was not considered as a necessary or fundamental part of a round barrows structure.

This lack of enhancement however cannot be carried over into the silted-up and partially silted-up Dolines that share the landscape of Bronkham. In all cases the Dolines are marked by strong magnetic responses from the Gradiometer surveys. Those on the eastern side of the surveyed area (Fig 7) are marked by very high magnetic signatures and suggest the presence of metal in large quantities, probably from the deliberate filling of large holes that would be a danger for animals in what is predominantly land that is used for grazing.

The two northernmost Dolines that appear on the gradiometer plot (Fig 7) appear as much lesser features and whilst they are visible on the ground as topographic features (Fig 8) it would appear that they are likely to have been silted up more naturally and over a longer period of time. The magnetic enhancement of the fill of these latter Dolines may have been somewhat sporadic and derived from off-site areas, interspersed with long periods of natural in-situ silting.

It is unlikely that geophysics will provide any additional data on the sub-surface presence and character of archaeological features and consequently may require a more invasive approach.

Clandon Barrow

The area survey conducted around the Clandon Barrow has produced an interesting data set which highlights three principal features which have a bearing on the ultimate interpretation of the barrow.

As indicated previously (see above) Clandon Barrow is quite an imposing barrow which survives to a height of approximately 6 metres and one might expect that it would feature a large enclosing quarry ditch from which the mound would have been created. As both the aerial photograph (Fig 5) and the Digital Terrain Model (DTM – Fig 14) indicate such a ditch does not survive as a visible or measurable topographic feature.

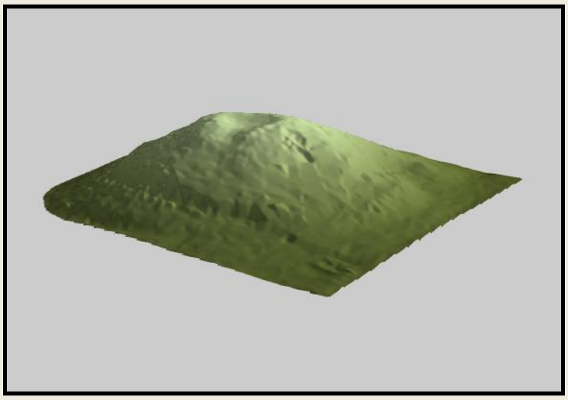

Fig 14 The results of the topographic survey of Clandon Barrow displayed as a Digital Terrain Model (DTM) viewed from the south east. Clearly visible in the top of the barrow is the remaining hollow of Cunnington's 1883 excavation.

The base of the mound does highlight an area of low resistivity that may be a response to the effects of the scraping up of soil immediately surrounding the barrow. The hollowed out 'scoop' that may have resulted from such an exercise may well have partially silted up over time, and could possibly retain moisture that would result in a lower resitivity value. However, the volume of soil needed to create the barrow that survives today would likely necessitate a much larger 'scoop' than can be inferred from the resistivity plot.

The northern edge of barrow mound is marked by an irregularly shaped anomaly which is of high resistance (shaded black). The interpretation of this anomalous feature is unclear. Such a high level of resistance would imply a very dry or free draining deposit which could be as a result of quarrying or alternatively the remnant of a natural deposit of sand and/or flint.

The evidence therefore for a surrounding ditch for the barrow would appear to be absent, however, the slight trace of an arching anomaly about 8-10 metres from the edge of the barrow in its south-west quadrant may be significant in this regard but the evidence is unconvincing at this stage.

The southern half of the image (Fig 15) is marked by agricultural lines commensurate with plough marks which articulate to the current field but interestingly pre-date the field boundary divide which bisects the field north/south and kisses the eastern flank of the barrow.

The pseudo-section produced by the ERT survey (Fig 16) also identifies a number of anomalies which are suggestive of a complex structure to the mound which to a certain extent mirrors the results from the Twin Probe Array area survey.

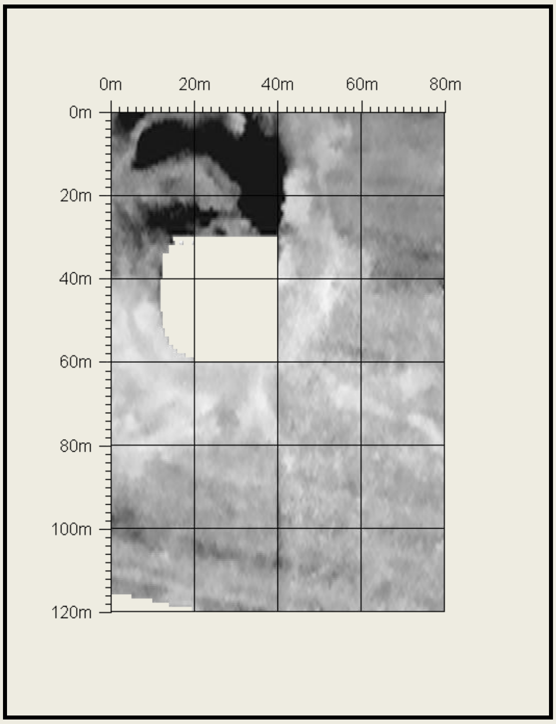

Fig 15 A grey scale plot of the Twin Array Resistivity Survey around Clandon Barrow. Plotting parameters are clipped at 28- 112 ohms (darker = higher resistivity). North is to the top of the page.

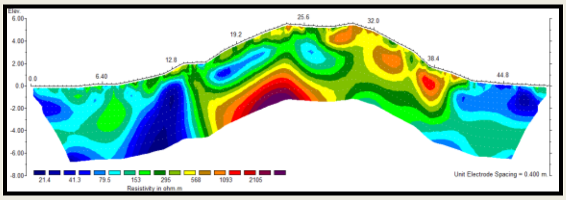

Fig 16 A psuedo-section through the Clandon Barrow based on ERT data (see also Fig 11 for location of transect. (left-right = east-west).

It is clear that the resistivity values on the east and western side of the barrow are very different which may well indicate differential moisture content that in turn may be a factor of differential layering in the barrows construction. The influence of Cunnington's 1882 excavation through the top of the barrow can be clearly seen as can the relatively low resistivity evidenced at the foot of both sides of the barrow. It is at the foot of the barrow that we see the two resistivity surveys using different systems and probe configurations producing comparable data. Clearly the base of the mound appears to show lower resistivity responses that would be consistent with a hollowed out scoop or residual ditch that is retaining moisture.

The pseudo-section is less clear however, on an identifiable interface that may indicate two or more phases to the construction of the barrow. There is a tantalising difference in the resistivity response between the upper and lower levels within the barrow, particularly to the eastern half which might imply two phases of construction (and therefore two barrows one atop the other) but the results of the ERT alone are inconclusive in this regard.

The results from the Ground Penetrating Radar Survey are however, slightly more forthcoming and revealing although still a little complex and subject to further analysis.

The radar slice through the barrow depicted below (Fig 17) was taken along a transect which was aligned almost 90degrees from that of the ERT transect.

The signal from the GPR 500 MHz antennae has a relatively good resolution to a depth of 3 metres from which point the signal begins to attenuate. However, the reflected signal does show quite clearly an interface between two constructional elements that would be indicative of one mound constructed atop another pre-existing mound (viewed on the right –hand side of the image). There is also some indication which supports Cunnington's account of layering of deposits in the upper makeup of the barrow but interestingly this shows up more clearly on the northern flank of the barrow and much less so on the southern half. This differentiation may also go someway in explaining the differences marked in the two sides of the ERT section.

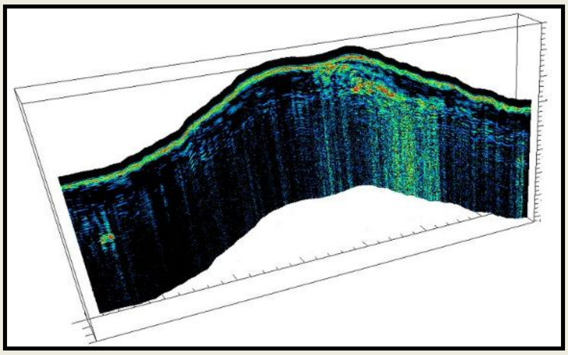

Fig 17 A Ground Penetrating Radar (GPR) slice through Clandon Barrow. (see also Fig 11 for location of transect. (left-right = south-north).

It is hoped that further analysis of the additional GPR transects will shed further light on this complex constructional make-up of the barrow.

All of the above results provide some new evidence to add to the large body of data that already exists on the Bronze Age Barrows of not only the South Dorset Ridgeway but also those located further afield. The results provide perhaps a small glimmer of light to better illuminate our collective knowledge of them but perhaps most importantly they do validate a non-destructive approach to the investigation of such monuments and point the way to the further potential of such research.

Acknowledgements

Any work undertaken within rural landscapes is heavily dependant upon the goodwill and permission of the farming community and the fieldwork at both Bronkham Hill and Clandon Hill was fortunate in having the support of farmers John Booker (Bronkham) and Nick Finding (Clandon). We hope that we did not get in the way too much.

In addition to the authors several people were involved in the field work during the sporadic fieldwork over the three years of seasonal surveys, some lent a day of their time whilst others committed to longer periods and to all of the following we are extremely grateful (in no particular order):

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The survey at Clandon Barrow was largely the result of a conversation with Peter Woodward in the spring of 2009, on the particular archaeological questions that the monument posed. His encouragement was greatly appreciated as was his extensive knowledge of the Ridgeway.

The authors also wish to thank English Heritage for (Section 42) consent to undertake the geophysical surveys on the Scheduled areas of both Bronkham Hill and Clandon Hill.

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