Survey at the Earl's Bu, Orphir, Orkney 1989–91

Geophysical work on a Late Norse Estate Complex

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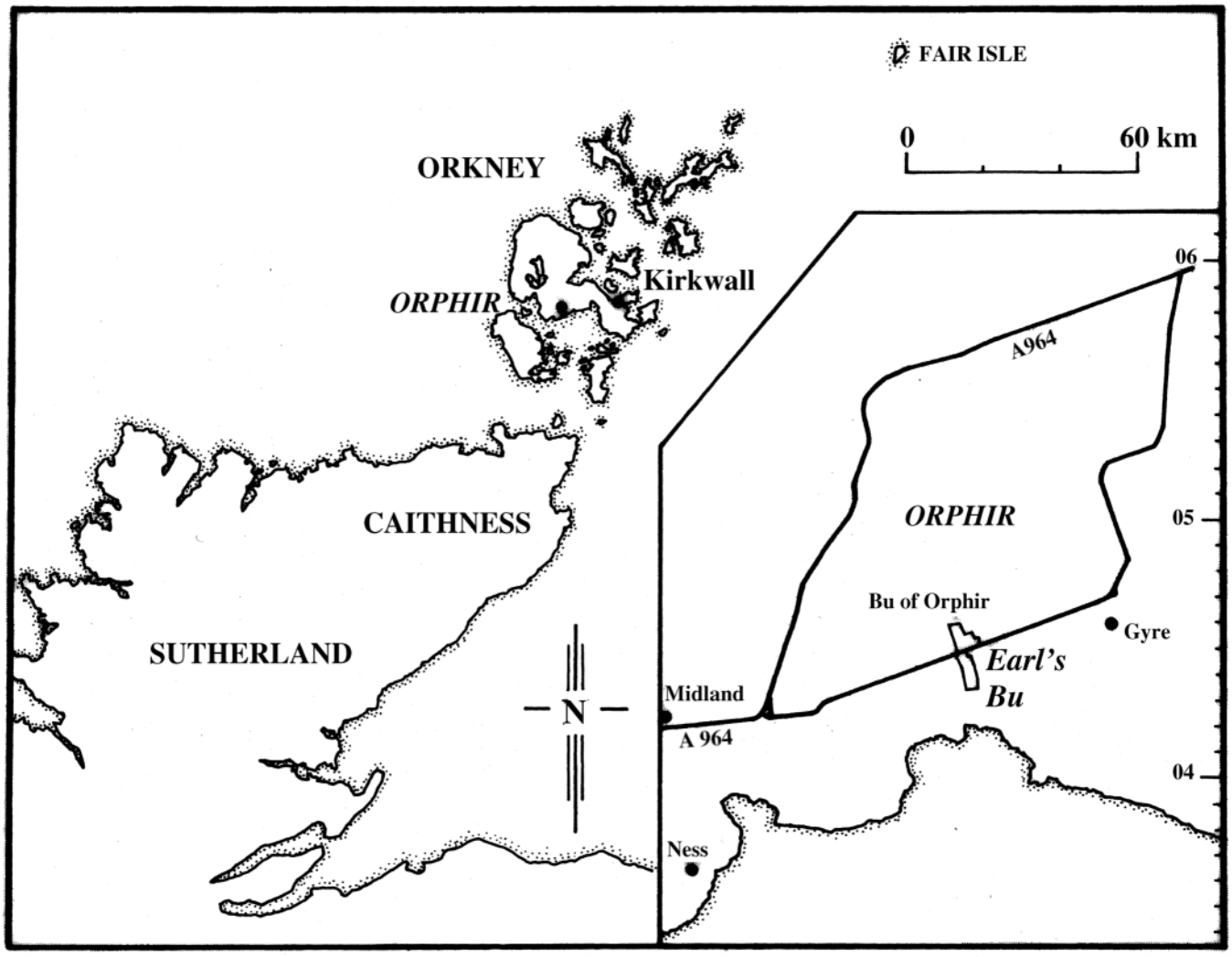
1 Summary

The various campaigns of geophysical survey at The Earl's Bu and its environs have added to the body of information known about the site (the early 12th-century seat of Earl Haakon Paulsson, with a round church, a large hall, a Late Norse midden and an earlier horizontal mill), confirming both considerable disturbance and potential structural traces. A separate print publication (Batey 2003), to which this particular SAIR is an adjunct, reviews the interventions made at the site up to the late 1930s.

In some cases, the surveys have raised more questions than they have answered, particularly about some putative burnt mounds (or stone-dense midden spreads or similar anomalies). The geophysical survey has also indicated a number of features which may represent early excavation trenches. While it is often impossible to be definitive in the interpretation of geophysical anomalies, especially in Scottish contexts where geological conditions can be unhelpful in the application of archaeological geophysical survey, interpretation must be an informed process. In the case of the environs of the Earl's Bu, if it were not for the excavations that were being run concurrently with the surveys, and the excellent and rapidly-published research of others working in the Northern Isles, that interpretative process would have been far more difficult. The report concludes that more excavation of geophysical anomalies is required; the next logical stage is to excavate prior to the laying-out of the site for comprehension by the visiting public.



Illus 1 Earl's Bu, Orphir, Orkney: location map (by Caitlin Evans)

2 Introduction *by Colleen Batey and Paul G Johnson*

2.1 The background and progress of the work

The archaeological project at the Earl's Bu began with small-scale excavations in 1978 and continued in successive years as funding became available. As part of the initial survey work at the site, geophysical examination was undertaken by Harvey Watt of Durham University. The use of geophysical examination of archaeological sites was at that stage in its infancy, and methods of transcription were crude in the light of future developments. Despite detailed survey in the area which was subsequently excavated and which revealed the chamber and walling remains of a horizontal mill (eg Batey 1993, fig 1, 20), no features of archaeological significance could be discerned from this work. In retrospect, the amount of disturbance and modern dumping of ironmongery from the farm, a collapsed field wall and the depth of archaeological features militated against the success of this early geophysical work.

In successive seasons, however, three campaigns of geophysical survey were undertaken in the vicinity of the site. The first, in 1989, sought to examine the area immediately adjacent to the consolidated remains of the Round Church and Earl's Bu, partially excavated by A W Johnston in 1900–01 (Johnston 1903) and again by workmen employed by the landowner William Grant in 1939 prior to the site being taken into Guardianship (see Batey 2003). Also in 1989, the nearby potential metalworking site of Lavacroon, identified by field-walking (Batey with Freeman 1986) was examined through geophysical survey, and this is to be reported on elsewhere. It was hoped that the survey of the Church and Bu area would delimit the extent of the archaeological remains sampled by the early excavation, and that it would be possible to offer some observations regarding the state of preservation of those remains.

In 1990 the survey area was expanded in order to include several areas where it was suspected, on the basis of local information, that archaeological remains might exist, and to address certain issues raised by the excavation of the site of the horizontal wheeled watermill associated with the Bu complex. One survey in this season duplicated part of one of the surveys undertaken in the previous season at a higher sampling density (reported on in interim form in Johnson 1990).

A further survey was commissioned by Orkney Islands Council in 1991 in an attempt to clarify the results of part of the 1989 survey centred on the remains of the Earl's Bu. The area covered by the earlier survey had been severely restricted by modern boundaries and agricultural machinery, which were removed in order to facilitate the 1991 work.

The reports upon which this publication draws were written between 1990 and 1994 and revised in 1998–99.

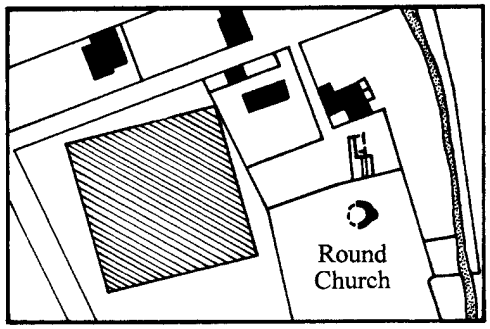
2.2 Earl's Bu *by Colleen Batey*

Interventions of a quasi-archaeological nature at the Earl's Bu complex at Orphir began *c*1859 with the actions of George Petrie (Petrie 1859), continuing in 1900 with more extensive work by the local antiquarian A W Johnston (Johnston 1904). During these phases of work, the distinctive Round Church dedicated to St Nicholas was in part a focus of attention, but more particularly, the fragmentary walling in the vicinity. The Church and the parts of buildings were considered to be the remains of the complex described in the *Orkneyinga Saga* (Taylor 1938, chapters LXVI and LXVII), including the remains of the Earl's drinking hall. Further work between 1938 and 1947 was under the charge of James Storer Clouston and W Grant, and the records from this period of work are scant, even by comparison with that which had gone before. However, walls and middens were revealed, along with a Pictish symbol stone incorporated into 'The Pend Tower', but it is hard to fully appreciate the nature and phasing of many of the fragments of walling identified in this work. All the interventions made at the site up to the 1939 phase of activity are being published elsewhere (Batey 2003).

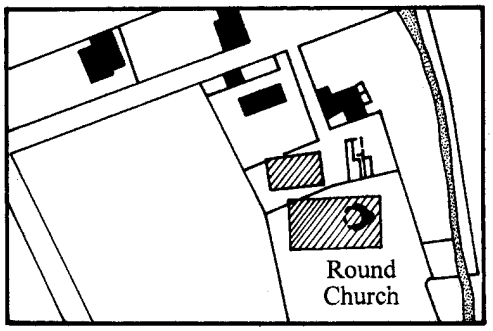
However, in 1978 the farmer alerted Colleen Batey and Chris Morris to a stone-lined passageway close by the remains taken into Guardianship following the bequest of W Grant in 1947. Successive excavation seasons revealed that this passageway was in fact the leat of a horizontal water mill, bedded on Viking midden and itself infilled by Late Norse midden material, thrown from the structures partially revealed by Storer Clouston and Grant to the south. This important work will form the subject of a further paper once the full implications of the rich environmental deposits have been fully studied (see meanwhile Batey 1993). The evidence of a Norse horizontal mill as an adjunct to this complex revealed both through earlier excavations and more recent geophysical prospection, in addition to the work at nearby Lavacroon (Batey with Freeman 1986; Johnson and Batey forthcoming), confirms this site as a major focus of high-status Norse activity on the Orkney Mainland.

EARL'S BU
Orphir
Orkney
1989 - 1991

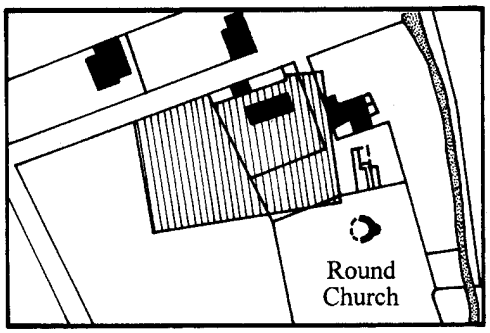
Geophysical: *West Field and Churchyard, 1989.*

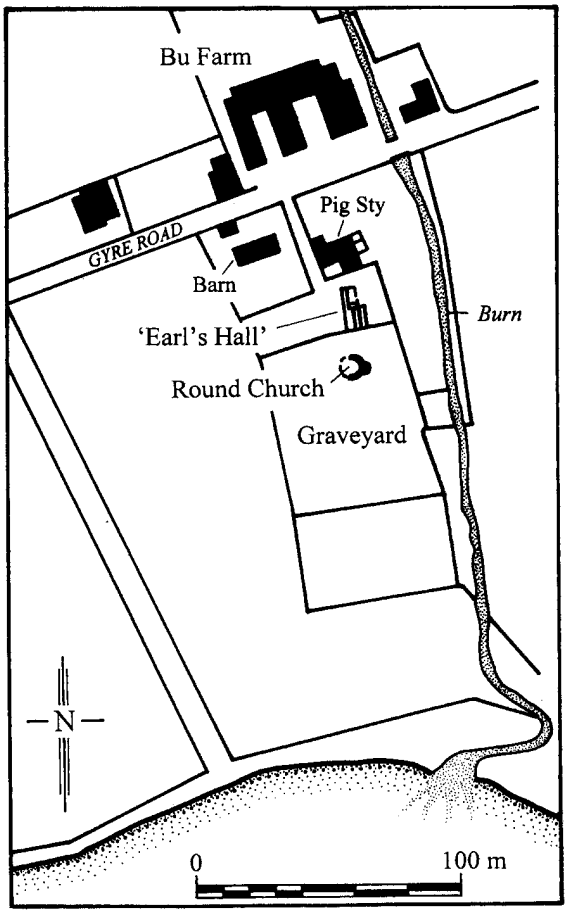


Geophysical: *Guardianship Area, 1990.*



Geophysical: *West Field and Guardianship Area, 1991.*





Illus 2 Earl's Bu, Orphir, Orkney: the areas of geophysical survey (by Caitlin Evans)

2.3 Survey design and methodology *by Paul G Johnson*

In terms of the methodology employed, in all of the surveys two geoprospection systems with proven ability in archaeological circumstances were utilised: electrical resistivity survey and geomagnetic survey. In some instances, especially in 1989, they were employed in tandem, with both devices being used in the examination of exactly the same area. The surveys of 1990 were more selective with only certain areas receiving both electrical and geomagnetic surveys. The 1991 survey once again employed both systems over exactly the same area.

The sampling densities employed in the surveys also varied. All of the 1989 surveys were undertaken at a uniform sampling density of 1.0m. since this was considered to represent a satisfactory compromise between area coverage and the resolution of any feature detected in the time available for the survey. In 1990, the larger area surveys, designed primarily to locate rather than elucidate, were once again conducted at a uniform sampling density of 1.0m, but in certain areas where further clarification of potential archaeological features was considered desirable, part of the survey was repeated employing a uniform sampling regime of 0.5m. The 1991 survey was undertaken at a uniform sampling density of 0.5m only. In all cases the sites under investigation were surveyed as a series of grids, either 20m or 10m square depending upon the sampling density being employed.

The instruments employed in all of the surveys were of 'Geoscan' manufacture. In 1989 these were a FM18 fluxgate gradiometer and a RM4 electrical resistivity meter. In 1990 the same electrical resistivity system was used but a FM36 fluxgate gradiometer was substituted for the FM18. In 1991, the FM36 was again employed but an RM15 electrical resistivity meter replaced the RM4. The electrode configuration used in the earlier seasons (a resistivity meter utilising a twin electrode probe configuration, employing a unit probe separation value) was once more pressed into service.

2.4 Data processing and presentation *by Paul G Johnson*

At the time of the surveys in 1989–91, there was relatively little choice in the mechanism for the processing of geophysical survey data in the field. Computer software designed specifically for use with geophysical data sets was fairly uncommon and few of those programs that were available could run outside of the environment of a mainframe computer. One of the most accessible programs at that time was the product graphics of the sites of 'Geoscan' in the form of 'Geoplot' which was a relatively straightforward dot-density graphics package in its first version. All of the data from the Orphir surveys were initially downloaded (or manually entered in the case of the RM4 data) into 'Geoplot' version 1 and dot-density plots produced. The intervening decade has seen huge advances in software engineering and as a consequence the data from these surveys have been reprocessed several times using a number of different programs. The graphics of the data published here (Illus 3–13) are far more sophisticated than previously presented, allowing more detailed interpretation, and are the product of 'Geoplot' version 3.

All the data were treated to similar processing regimes. The individual grid data files were assembled into a site data file and then balanced in order to remove any inconsistencies between the constituent grid files. The data were then de-spiked in order to remove seriously anomalous readings and, only if considered essential, treated with a Gaussian filter, high or low pass depending upon the type of survey and the circumstances of the data set. The data were finally interpolated in both x and y directions and the image processed in order to best represent the archaeological qualities of the site. The images presented here are annotated numerically in order to facilitate discussion of the features found.

3 The results and interpretation *by Paul G Johnson*

3.1 Introduction

The areas of survey were as follows (Illus 2, above): the cemetery and church area; the Bu Lawn, which corresponds to the rest of the Guardianship area; the West Field which is the area adjacent to the western boundary of the Guardianship Area; the East Field, lying to the east of the burn which runs along the eastern side of the Scheduled Area, slightly down-slope from the Guardianship Area.

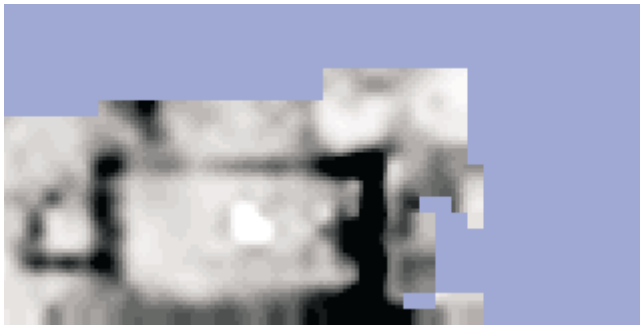
In addition, survey was also undertaken at Lavacroon and in the North Field, and will be presented as a separate report (Johnson and Batey forthcoming); only the work in the North Field, which indicates the line of a potential water-source from the mill dam to the Norse mill may be associated with events taking place adjacent to the Guardianship site. Although it is worth pointing out that the site of Lavacroon is clearly a metal-working complex, which may have supplied the material for the metalwork identified in the earlier excavations at the Bu (discussed in Batey 2003). All these areas form part of the same Earl's Bu, or farm estate complex.

3.2 The cemetery area

The cemetery contains the partial remains of the Round Church, and until relatively recently contained the 19th-century parish church for Orphir built in 1829. This has now been demolished and the present parish church is sited some distance inland of the Bu. The 18th-century predecessor of the 19th-century church was situated a small distance to the south, built in 1705 and repaired in 1756 and was demolished at the time of the building of the replacement. The results of the gradiometer and resistivity surveys undertaken within the confines of the cemetery adjacent to the remains of the Earl's Bu are shown in Illus 3 and 4. It is possible that remains of this earlier church may be visible in the resistivity plot (Illus 4), at its southern edge. The new church was partially built upon the remains of the Round Church, dated to the 12th-century, the act of construction most probably resulting in the further ruination of the latter. Despite the fact that the only visible remains within the cemetery are those of the Round Church, it is still an active cemetery and as a consequence the space available in which to attempt geophysical survey is very restricted.

Both surveys were designed as an attempt to detect any subsurface remains that might be attributable to the Round Church, and both have failed in that objective. However both surveys did detect the remains of the 19th-century church with clarity, the site of the altar even being visible in the resistivity graphic (Illus 4). The survey's failure to detect any remains of the Round Church might be the result of one or other of two factors. The remains might be situated at a depth effectively out of the range of the two survey techniques used, or the stone of the western portion of the Round Church may have been completely robbed out during the construction of the 19th-century church. In support of either hypothesis, A W Johnston, who partially excavated the remains in 1900–01, observed that the floor of the apse of the round church was situated at a depth of 3 feet (0.9m) below the then ground surface (Johnston 1903, 28). This depth is greater than the maximum depth of sensitivity of either of the devices used in the less-than-ideal conditions of this survey. In addition it would seem more than likely that the foundations of the 19th-century church would have exceeded this depth anyway thus completely removing the western half of the remains.

*Illus 3 EB89 Cemetery Gradiometer survey. Survey Area: 20 × 40m N^*

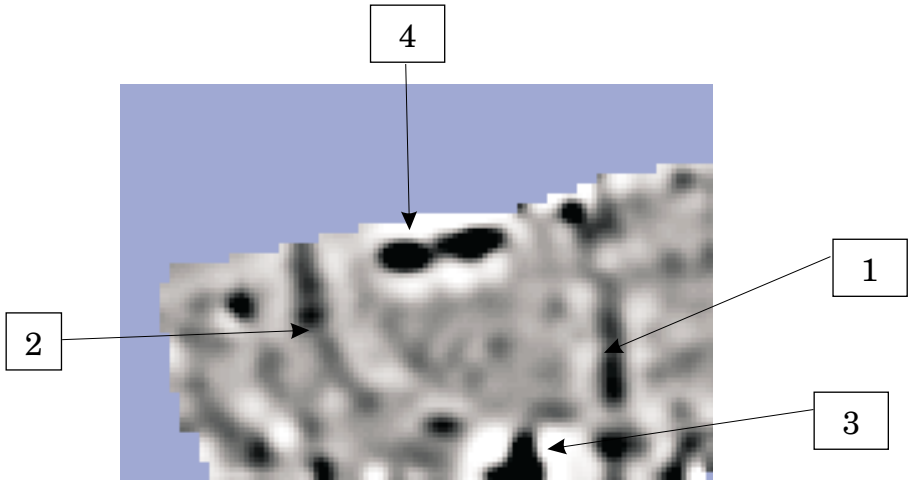


*Illus 4 EB89 Cemetery Resistivity survey. Survey Area: 20 × 40m N^*

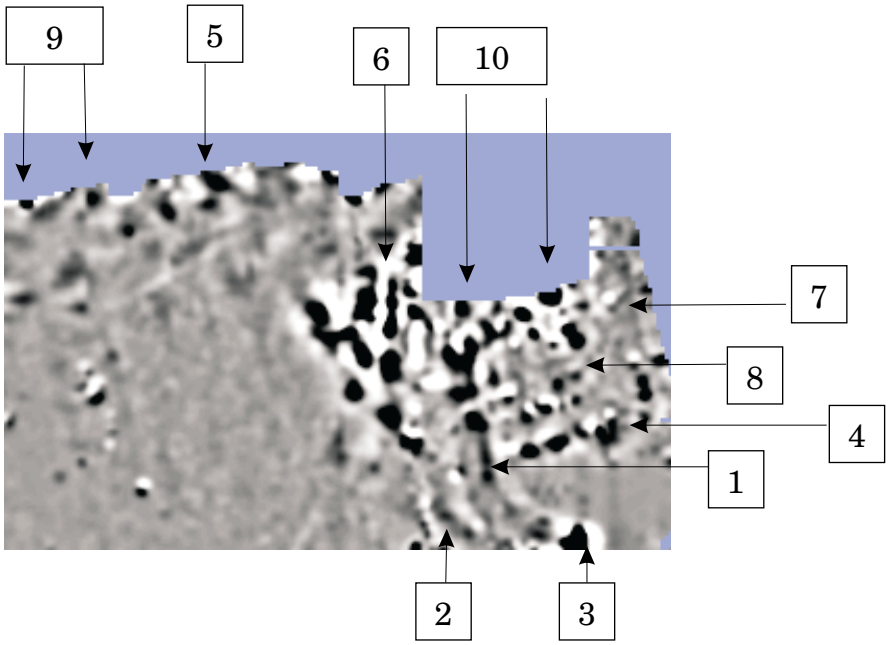
3.3 The Bu Lawn

The Bu Lawn is a small plot of ground situated immediately to the west of the consolidated remains of the Earl's Bu. At the time of survey, the area was extremely restricted and bounded on two sides by wire fences. The third and fourth sides are bounded by the cemetery wall and the footpath leading from Gyre Road to the cemetery. The Bu Lawn was surveyed with both resistivity and gradiometry equipment in 1989 but the area coverage was so restricted and the relatively coarse sampling regime employed rendered the interpretation of anything tangible in the results of these surveys impossible. As a result, an area of 30 × 20 metres of the Bu Lawn was surveyed in 1990 using the gradiometer only at a uniform density of 0.5m. The survey attempted to identify subsurface features that may indicate further remains associated with the structures of the Earl's Bu. That such remains exist are hinted at in the reports produced by A W Johnston (Johnson 1903, fig 1, 23) and in the plan drawn by D Wilson recording structures discovered in excavations undertaken in 1939 (this last is the only surviving record of this period of work at the site: see illus 9–11 in Batey 2003).

Unfortunately, the interpretation of the results in archaeological terms was problematic due to the restricted area available for study. Feature **1** in the gradiometer plot (Illus 5) is a positive linear anomaly, while Feature **2** is a curvilinear positive anomaly. Both these features could be real cuts and/or fills, although they could equally be the after-effects of any of the periods of excavation in that area as trenching



*Illus 5 EB90 Bu Lawn Gradiometer Survey. Survey Area: 20 × 20m N^*



*Illus 6 EB 91 Bu Lawn / West Field Gradiometer survey. Survey Area: 50 × 70m N^*

in the Bu Lawn is indicated in the records of both the Johnston and the Grant fieldwork.

Feature **3** is a large dipolar anomaly indicative of a large fragment of ferrous material and Feature **4** is similar. Meanwhile the plot of the resistivity data does not really contribute anything further to the interpretation of this part of the site.

The 1991 surveys covered areas which had already been examined as a group of discrete surveys in 1989, as well as an area which had previously been unavailable. This was made possible by the removal of a number of fences separating the West Field from the Bu Lawn and a new area adjacent to a substantial barn (now demolished). The gradiometer and resistivity surveys were undertaken at a uniform sampling density of 0.5m.

This area is characterised by large clusters of dipoles (Illus 6), some of which were identified in earlier surveys (e.g. Features **3** and **4**). In contrast, some features identified in earlier surveys do not appear at all in this survey (e.g. traces of cultivation, see Illus 8), or only as ephemeral features (eg Feature **5**, which appears as a weak slightly negative linear feature in this survey [Illus 6], but as a strong dipolar linear feature in Illus 8 [feature 26]) despite the increase in sampling density in comparison with the earlier surveys. This is unfortunately an artefact of the processing regimes used upon the data, and the plotting parameters employed in the production of the graphic. All of the missing or weak features do exist within the dataset, but are so weak in comparison to the dipolar features as to appear insignificant in this graphic. It would be possible to remove all of the dipolar readings from the data and replace them with null readings in order to elucidate the weaker features, but that would result in a highly fragmented illustration of the magnetic qualities of the site. As it stands the 1991 gradiometer survey of the West Field/Bu Lawn (Illus 6) depicts a patterned distribution of dipolar activity interspersed with some identifiable linear and curvilinear features which may be of some antiquity, or else the result of very recent agricultural and land division practices.

Feature **6** is a possible ferrous dipole. Viewed in totality, this feature appears to be very similar in nature to a feature on Illus 10 (feature 32). Feature **7** is a weak linear feature which appears to link a number of small dipoles at the southern end of its course. It is possible that this then turns westward towards Feature 4 and intersects a northward extension of Feature 1. Such combination of features is suggestive of an enclosure of some description but this interpretation is offered only with extreme caution. Feature 7 runs near-parallel to the modern footpath leading to the cemetery, and Feature 4 is extremely close to a recent fence line; therefore this combination of feature might be of very recent origin. However, Feature 1 does cut that fence midway along its length.

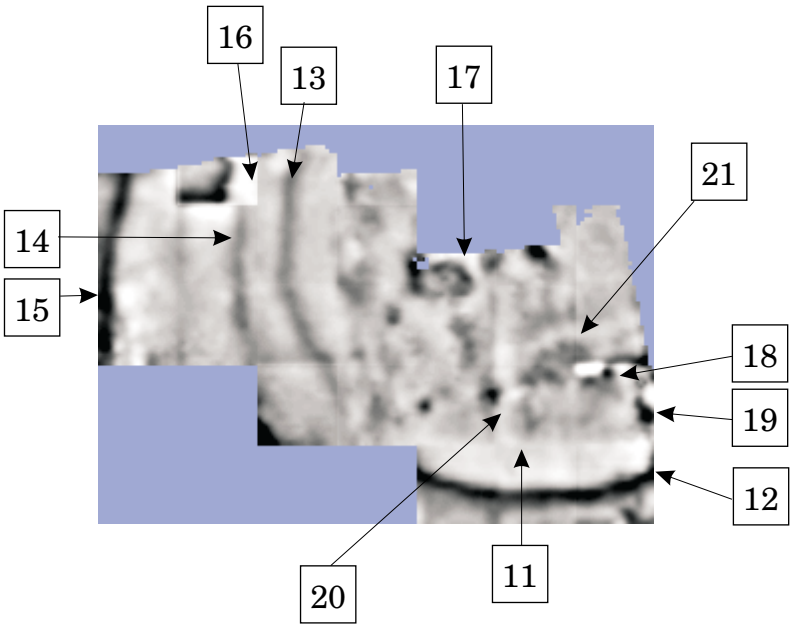
Feature **8** is a weak negative anomaly with a cluster of small dipoles at its western extremity. Feature **9** is an area cluster of dipoles situated close to the boundary fence of the West Field and Gyre Road, probably the result of ferrous material contained within that boundary. Feature group **10** is a cluster of strong dipoles of such magnitude to be unequivocally interpreted as of ferrous origin. They are located adjacent to the barn which was converted into the Saga Centre *c*1995.

The 1991 resistivity survey of the Bu Lawn/West Field area (Illus 7) is extremely interesting from a geophysical as well as an archaeological perspective. There are several problems with this data-set, and although exactly the same area was covered by both survey techniques, it became necessary to omit several of the resistivity grids from the final presentation of the data. The problems encountered in this data-set were not a product of the survey methodology but rather lay in the choice of instrument and electrode configuration. Under normal conditions, performing an electrical resistivity survey with a 'Twin Electrode' configuration is quicker than with most other electrode configurations. This is because the mobile element of the 'Twin Electrode' system is independent of orientation and the data collection process can be undertaken in a zigzag fashion rather than in parallel traverses.

In extremely rare circumstances, resistivity data can be anisotropic (i.e. the ground exhibits a directional bias in its resistive qualities) This appears to have been the case with certain grids of the 1991 survey and it is essential to point out that no trace of this effect was noted in 1989. In 1989, the survey traverses were perpendicular to those employed in 1991, a tactic deliberately deployed in order to use the earlier data set as a control for the 1991 survey, and the instrument used was the RM4 resistivity meter rather than the RM15 of 1991. There are differences in the manner in which these two devices evaluate the electrical qualities of sites and this may have contributed to the effect, along with a change of survey direction and the undoubted geological quirkiness of the Earl's Bu site.

Feature **11** is an area of anisotropic data, the effects of which have been lessened by processing. In its raw form, the data was badly striped. The effect does not cover the entirety of the survey grids concerned but is restricted to an area to the north of Feature 12. Feature **12** is a well-defined curvilinear band of high readings and appears to be one a series of concentric features of similar nature (Features **13**, **14** and **15**). It is these features that seem to be causing anisotropy in the data; as long as the mobile electrodes of the 'Twin' were on the same side of the feature as the remote electrodes, the effect did not occur but as soon as the mobile electrodes had passed over the high resistance bands, they appear to have become directionally dependant. Sometimes the striping effect was contained within the features, at other times it was to the outside depending upon the position of the remote electrodes at the time of the survey.

Feature **16** is a part-grid of anisotropic data which has not yielded to processing and is included for



*Illus 7 EB 91 Bu Lawn / West Field Resistivity survey. Survey Area: 50 × 70m N^*

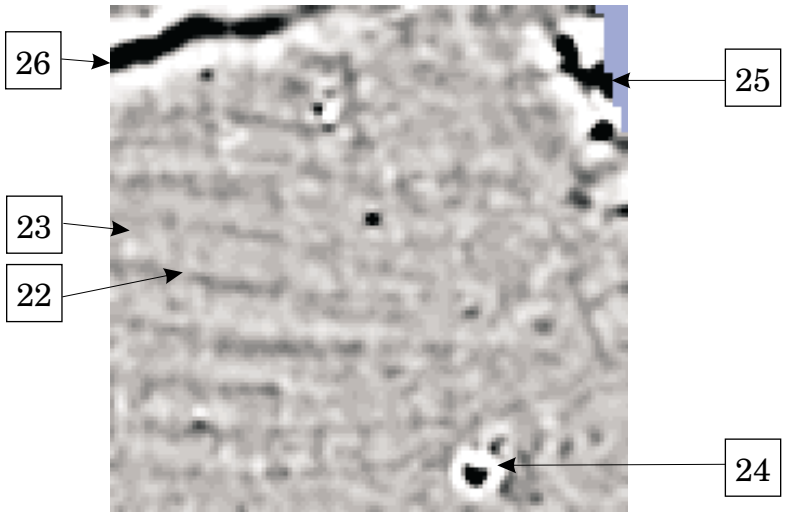
demonstration purposes only. As can be seen in Illus 7, it appears as disturbance of Feature 14. Feature **17** appears to be structural. It is a combination of high and low readings situated very close to the (then) extant barn and where the presence of archaeological features had been demonstrated during the construction of the barn (see Batey 2003). Feature **18** is a band of low readings combined with the odd patch of high readings. Its regularity might indicate the existence of a fairly recent cut feature, such as an excavation trench. Feature **19** is an isolated area of high and low readings and a similar interpretation to Feature 18 may be offered.

Feature **20** is a linear band of low readings, probably a cut feature, which corresponds to the northern extension of gradiometer feature 2. It vanishes completely when it enters the area of anisotropic data, Feature 11, but possible re-emerges as a feature to the south of Feature 12. Feature **21** is similar but near-perpendicular to Feature 20 . Once again this feature is probably a cut.

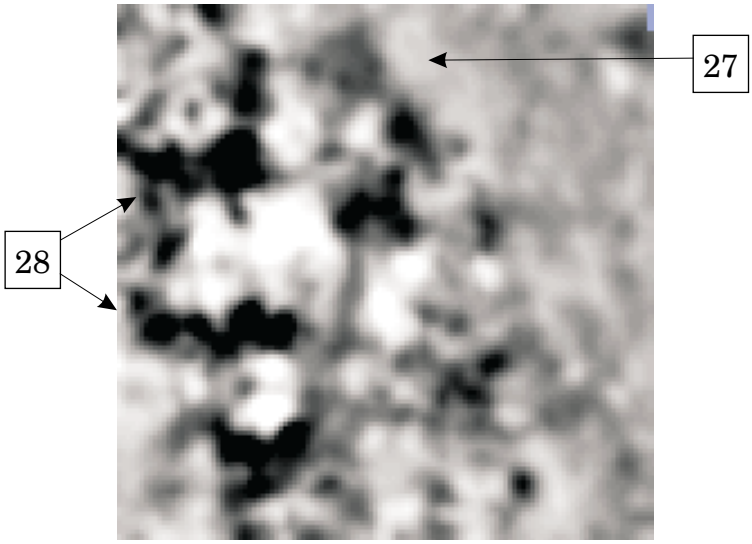
3.4 The West Field

The West Field is situated immediately to the west of the Bu Lawn and Cemetery sites. Work here did not suffer from the space restrictions which compromised the surveys of those sites, enabling a larger area to be examined. Several features were detected in the gradiometer survey (Illus 8), some of which can be categorised by group.

Feature group **22** is a series of parallel linear anomalies best interpreted as the product of past



*Illus 8 EB89 West Field Gradiometer survey. Survey Area: 60 × 60m N^*



*Illus 9 EB89 West Field Resistivity survey. Survey Area: 60 × 60m N^*

cultivation. Feature group **23** is similar but almost perpendicular to Feature group 22. Feature **24** is a single strong dipole indicative of ferrous material.

Feature group **25** is a small group of dipoles also of possible ferrous origin, or else suggestive of a discrete area of thermo remnant magnetism.

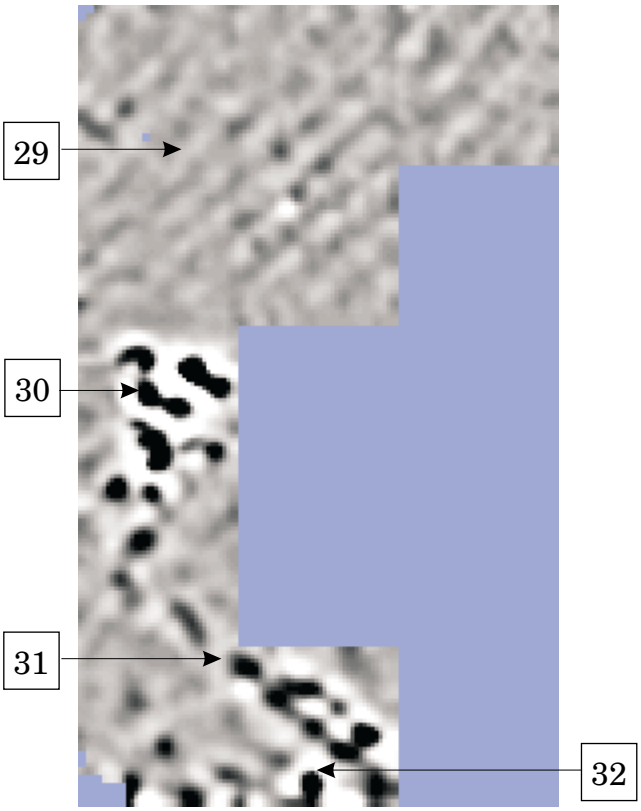
Feature **26** is odd. It appears, in Illus 8, as a strongly dipolar linear feature, but this is misleading. Feature 26 also appears in a survey of 1991 as a relatively weak linear anomaly (Illus 6, feature 5) and its apparent strength here is a product of the plotting parameters employed in the production of this particular graphic. It is probably an archaeological feature but its position at the edge of the survey area precludes credible interpretation, although it may be the old kirk road.

Little of archaeological interest was detected in the West Field during the course of the electrical resistivity survey (Illus 9).

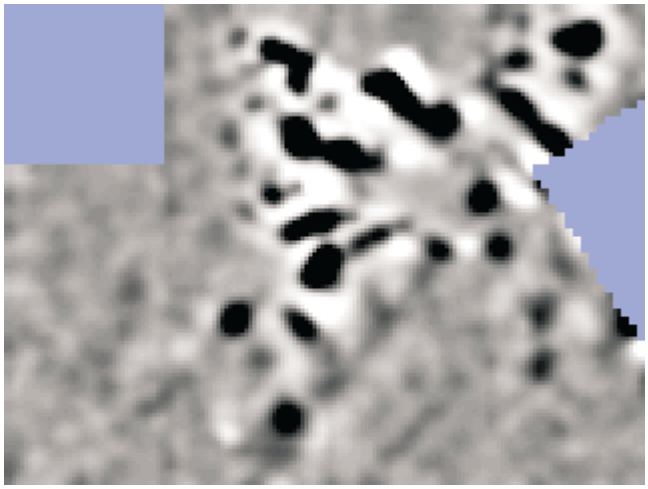
Feature **27** is a diagonal boundary separating areas of relatively uniform resistivity from a noisier area to the west. This latter area corresponds with the crest of a slight ridge which runs the entire length of the West Field towards the sea. Feature group **28** comprises broad bands of high resistivity readings. They may represent structural remains but are too badly defined to offer definitive archaeological interpretation. It is possible that Feature group 28 represents spreads of rubble but there are no corresponding gradiometer anomalies in the vicinity. Perhaps the most plausible interpretation is that Feature group 28 is natural, a product of the drift geology of the area.

The 1990 West Field survey was focused around the southern perimeter of the cemetery and sought to identify anomalies which might equate to earlier activity. Two gradiometer surveys were undertaken: the larger of the two at a uniform sampling density of 1.0m in order to locate features of potential interest (Illus 10). This was followed by a survey of a smaller area undertaken at a uniform 0.5m sampling density in an attempt to clarify features detected in the larger survey.

Feature group **29** is a series of parallel striations running almost due north-south the length of the West Field. They are most probably associated with



Illus 10 EB90 West Field Gradiometer survey. Survey Area: 60 × 100m N⁻¹



Illus 11 EB90 West field Gradiometer survey. Survey Area: 30 × 40m N <

past agricultural activity. Feature group **30** is a cluster of strong dipolar anomalies. These may represent a very large deposit of ferruginous material or may indicate an area of high thermo-remnant magnetism such as those exhibited by burnt mounds (Dockrill 1991, 35). Other examples have been noted in the immediate vicinity. Feature group **31** is composed of a linear series of dipolar anomalies. The feature continues towards the west of the survey area where it appears to turn almost 90 degrees and head towards feature 30. The return is not altogether unequivocal due to the occurrence of examples of the putative agricultural features (Feature group 29) in this area too. The somewhat amorphous nature of Feature group 31 prompted the second gradiometer survey of this area which attempted to increase the resolution of this particular feature. Feature **32** is a large single dipole most likely to be of ferrous origin. Several other examples exist in the area.

The second survey (Illus 11) of the West Field in 1990 was centred upon the dipolar features (Feature group 31) detected in the previous survey. The second survey was undertaken at a uniform sampling density of 0.5m and also covered ground adjacent to the cemetery wall not covered by the 1.0m survey.

This second survey detected further dipolar activity closer to the cemetery but did not really succeed in increasing the resolution of the dipolar features. If these features are the result of areas of high thermo-remnant magnetism, then they appear to exhibit little in the way of the structural integrity demonstrated by Dockrill for the burnt mounds at Shelly Knowe (Dockrill 1991, 37) and Fair Isle (Dockrill 1991, 36). Feature group 31 could still represent the remains of similar activity, albeit badly damaged by later agricultural practices, but otherwise the dipolar activity might have resulted from industrial activity occurring in a later period. Excavation of these dipolar features would seem the most appropriate way of clarifying this issue of interpretation.

3.5 The East Field

The survey of the East Field was designed to examine a small flattish mound that lies in the south of it, and the immediate surroundings (Illus 12). A number of features were detected in the gradiometer survey, some of which can be classified into groups.

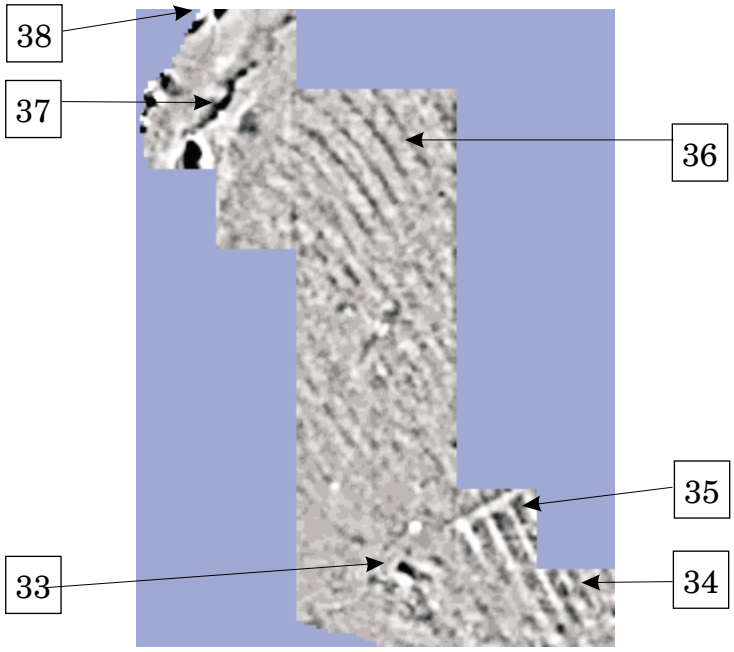
Feature **33** corresponds with the location of the mound. It is a small rectilinear negative feature containing an area of magnetically-enhanced material. It has the appearance of a smallish building and could well be the remains of a croft or similar.

Feature group **34** is a series of negative near-parallel striations, most likely the product of past cultivation. Feature **35** is a single negative linear anomaly which is almost certainly associated with feature group 34 and probably represents a boundary since most (but not all) examples of feature group 34 terminate there. Feature group **36** is a series of long curved striations, probably of agricultural origin, but more likely to be associated with ploughing rather than spade cultivation. Feature **37** is a large dipolar anomaly, probably a significant dump of ferrous material. Feature group **38** is a series of nebulous curvilinear features probably of natural fluvial origin. This group of features lie in the immediate vicinity of a large stream and were probably generated by periodic flooding episodes.

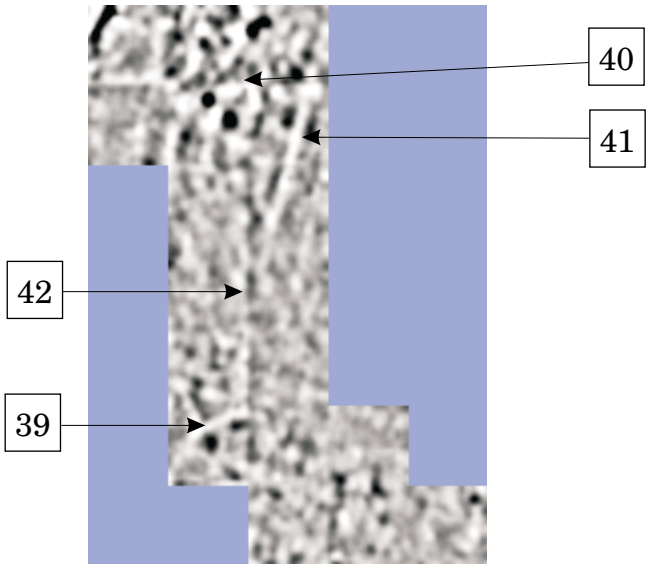
The East Field resistivity survey covered slightly less ground than the gradiometer survey and detected a series of features of a completely different character (Illus 13).

Feature group **39** is a collection of short curvilinear low resistivity anomalies. They equate with cut features but are too amorphous to offer a credible interpretation.

Feature **40** is a linear, low resistivity feature, again probably cut, and may perform some sort of boundary function. Feature group **41** is a series of parallel striations which may have some



Illus 12 EB90 East Field Gradiometer survey. Survey Area: 120 × 160mm N



Illus 13 EB90 East Field Resistivity survey. Survey Area: 100 × 140m N

relationship with feature 40 as they are essentially similar in character. They are located in a generally 'busy' area of the site. Once again they appear to be cut features and are likely to be the result of some past agricultural regime. Feature group **42** consists of weaker parallel striations running at an obtuse angle to Feature group 41. These too appear to have their origins in past agricultural activity.

4 Conclusions *by Paul Johnson and Colleen Batey*

The various campaigns of geophysical survey at The Earl's Bu and its environs have undoubtedly added to the corpus of information already known from the site. In some cases, the surveys have raised more questions than they have answered, particularly those of the putative burnt mounds in the West Field. It is often impossible to be definitive in the interpretation of geophysical anomalies, especially in Scottish contexts where geological conditions are often unhelpful in the application of archaeological geophysical survey, and it is always tempting to interpret on the basis of archaeological recognition of shape and dimension. This is a wholly subjective process which can lead the unwary to false conclusions. The transliteration from 'geophysical anomaly' to 'archaeological feature' is difficult and relies heavily upon the ability to understand the physical responses likely to be created by subsurface archaeological features as well as a knowledge of which archaeological features are likely to occur in the area of interest. Interpretation must be an informed process, and in the case of the environs of the Earl's Bu, if it were not for the excavations that were being run concurrently with the surveys, and the excellent and rapidly-published research of people such as Steve Dockrill and John Gater, that interpretative process would have been far more difficult. Clearly more excavation of geophysical anomalies is required. If we take Dockrill and Gater's burnt mound sites to be geophysical 'type sites' then the anomalies in the West Field do not readily conform to the type, but a badly disturbed burnt mound may be too difficult to distinguish from a stone-dense midden spread or similar anomaly.

These different surveys at the Earl's Bu have provided indicative information, confirming considerable disturbance and potential structural traces; the next logical stage is to excavate prior to the laying-out of the site for comprehension by the visiting public. The geophysical survey has however indicated a number of features which may represent early excavation trenches (discussed in Batey 2003) such as on Illus 7, features 18 and 19. These have been plotted out elsewhere (in illus 16 of Batey 2003) in an attempt to identify the location of some of the antiquarian activities at the site.

5 Acknowledgements

In line with all archaeological work, many pairs of hands enabled this data to be both collected and processed. These surveys were undertaken during excavation seasons where the remains of the horizontal mill and its environs were being worked on, and training in geophysical prospection was an integral part of the overall training exercise. Several generations of Durham University archaeology students undertook this work and the geophysical aspects were under the guidance of Harvey Watt in the initial stages and subsequently Paul Johnson, while the excavation was directed by Colleen Batey and Chris Morris. Many of those students remain active in several aspects of archaeology and we hope they enjoyed this part of their training.

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