APPENDIX 1

SUMMARY AND GUIDE TO ARCHAEOLOGICAL FINDS FROM BODIAM CASTLE

Kathryn A. Catlin

Excavations at Bodiam

The finds from Bodiam have been collected under various circumstances, formal and informal, over the 20th and 21st centuries. Excavations, survey, and collecting can be divided roughly into two phases: excavations that occurred prior to 1994, when the Scheduled Ancient Monument boundary was extended to include the landscape setting and grounds (Johnson *et al.* 2000, appendix four), and those that have occurred in the years since, most of which comprise watching briefs, mitigation activities, and geophysical survey. The total artefact collection also includes miscellaneous, largely unprovenanced finds made by individuals over the last three centuries, including tenants and property owners of the Bodiam estate.

The finds and their current locations are summarised in Table A1.A. For additional information about where the finds are currently held, the interested reader is referred to an earlier version of this chapter that was submitted to the National Trust in 2015 in the form of an unpublished report (Catlin 2015).

18th- and 19th-century collection

It is probable that numerous artefacts were collected prior to Curzon's excavations. No specific record of such early finds is known aside from, first, the cannon or field piece that has come to be known as the 'Bodiam Bombard' and second an oak dug-out canoe that was found in the river Rother near Bodiam Bridge in 1836 (Drury & Copeman 2016: 25).

Curzon's 1926 report on his excavation and survey work at Bodiam includes reference to a 'stone-throwing mortar' that was found in the moat prior to 1824, while the Websters held the land (1723-1829) (Curzon 1926: 95). Nineteenth-century references to this object are somewhat scattered and contradictory, but it was certainly at Bodiam prior to an 1825 publication, and resided in the Great Hall at Battle Abbey by the 1840s (Smith & Brown 1989). In 1862 it was purchased by the Woolwich Rotunda Museum (now the Royal Artillery Museum), where it is currently on display (Fig. A1.1).

The gun, which has been referred to either as the 'Bodiam Bombard' or the 'Bodiam Mortar', was constructed of both wrought and cast iron, a combination which may reflect early experimentation with casting: a 'missing link' between wrought and cast iron (Smith & Brown 1989: 16). It is likely that the mortar was constructed in Sussex, perhaps as late as the 16th century, though there is some disagreement as to the date and the provenance; some scholars have suggested that it could have been made on the Continent, and perhaps as early as c. 1350 (Smith & Brown 1989; Les Smith, pers. comm. 2015; Dan Spencer, pers. comm. 2015). A battle at Bodiam makes a compelling story, and indeed, the castle was briefly the site of action in 1483, during the Wars of the Roses. Though it could have been present at the siege, examination of the mortar has suggested it was most probably never fired (Smith & Brown 1989).

A canoe found in the river Rother in 1836 was likely associated with the underlying Bronze Age peat deposits. It disintegrated almost as soon as it was removed. The

Table A1.A: Excavations, finds, and archived locations as of 2015.

Date	Excavator	Finds	Dates	Location	Citation
18th-19th century	Websters?	Bombard, possibly other finds	c. 15th century	Firepower Royal Artillery Museum	Curzon 1926: 95 Smith & Brown 1989
1836	Fuller?	Bronze Age canoe from the river Rother	Bronze Age	No longer extant	Drury & Copeman 2016: 25, 157
1902	unknown	Pre-Roman cinerary urns (1 survives)	50 BCE-ACE 50	Bodiam Castle	Johnson *et al.* 2000: 26 Whistler 1940
1919-1920	Curzon & Weir	Building materials; metals (iron, lead, pewter, copper, coins); leather; stone tracery; glass; coins; assorted pottery; faunals; tobacco pipes; cannon balls	13th-20th century	Bodiam Castle	Curzon 1926 Gardiner *et al.* 1994 Myres 1935
1959-1960	Wingrove Payne	Roman finds	Roman	Battle Museum (probable)	Anonymous 1959-60 Cornwell *et al.* 2010 Priestley-Bell & Pope 2009: 4
1959-1960	Lemmon & Darrell Hill	Roman finds	Roman	Battle Museum (probable)	Lemmon & Darrell Hill 1966
1960	Puckle & Oliver	Roman road	Roman	Hastings Museum (probable)	Puckle 1960 Walling pers. comm. 2013
1961-1966?	Darrell Hill	Unknown finds from Gun Garden	unknown	Battle Museum (probable)	Darrell Hill 1960-61 Johnson 2002: 26 Taylor *et al.* 1990: 157
1970	David Martin	Building materials; metals (keys, nails, copper, pewter, iron); stone (tracery, whetstone); assorted pottery; faunals; tobacco pipes; wood	13th-19th century	Bodiam Castle	Gardiner *et al.* 1994 Martin 1973
1970s	Gwen Jones	Roman and medieval pottery	unknown	unknown	James & Whittick 2008
1990	David Martin	Finds from the moated homestead site	13th-14th century	Hastings Museum (probable)	Martin 1990 Walling pers. comm. 2013
1995	Archaeology South-East (ASE)	Pottery; tile; flint; coin	Mesolithic-20th century	unknown	Barber 2007b Stevens 1995; 1999
1998	ASE	Assorted pottery; building materials (tile, brick); iron; glass; faunals; ballast flint	13th-19th century	Bodiam Castle	Barber 1998
2005	ASE	Portcullis sample	1280-1410	Bodiam Castle	Martin & Martin 2005 Thackray & Bailey 2007
2007	ASE	Roman tiles; assorted pottery; building materials; tile; glass	14th-20th century	unknown; initially stored at ASE Ditchling	Barber 2007a; b
2009	ASE	Assorted pottery; tiles; faunals; leather and timber (6th century)	13th-20th century	unknown; ASE Portslade?	Priestley-Bell & Pope 2009
2009	ASE	Assorted pottery; building materials (tile, brick)	16th-19th century	unknown; ASE Portslade?	Grant *et al.* 2009
2010	Hastings Area Archaeological Research Group (HAARG)	Roman iron; Mesolithic flint; tile; ceramic	Mesolithic-14th century	East Sussex County Archaeology Office	Cornwell *et al.* 2010

Fig. A1.1: Bodiam mortar, on a modern carriage at the Royal Artillery Museum. Image courtesy of the Royal Artillery Historical Trust. Photo by L. Smith 2015.

remains were on display at the castle for several years but no trace now remains (Drury & Copeman 2016: 25, 157).

Early 20th century

Several cremation burials were found behind the Old Rectory in 1902, dated to between 50 BCE and CE 50 or possibly a little later (Whistler 1940; Johnson *et al.* 2000: 26; Thackray & Bailey 2007: 5-6; Cornwell *et al.* 2010: 3-4). Only one urn survives; it is part of the permanent Bodiam collection.

Lord Curzon's excavations during 1919/1920 led to some of the most varied finds from the site, including several coins; keys, spurs, and other metal objects; assorted pottery; shoes; and numerous other finds dating from the medieval period and later (Fig. A1.2; Curzon 1926: 157-9; Myres 1935).

1960s-1980s

Several archaeological investigations occurred in the Bodiam landscape between 1959 and 1966. Numerous Romano-British finds were collected from the vicinity of the Roman road, mostly on the floodplain to the south of the castle at Frerens Meade (the field acquired by the Trust in 2006, sometimes known as The Saltings) (Fig. A1.3; anonymous 1959-60; Puckle 1960; Lemmon & Darrell Hill 1966). Additional excavations were carried out south of Court Lodge, exposing finds of Roman, medieval, and later origin (Darrell Hill 1960-61; Lemmon 1960-61; Taylor *et al.* 1990: 157; M.H. Johnson 2002: 26). The moated site north of the castle was partially excavated in 1964 and 1970 (Martin 1990: 89).

In 1970, the National Trust contracted with South Eastern Archaeological Services (now Archaeology South-East) to drain the moat and conduct an excavation of the bridge and abutments under David Martin's direction (Martin 1973). The project led to detailed publications on the construction of the moat and bridges as well as some finds. Later in the 1970s, Gwen Jones carried out some field walking at Freren Meade and collected a small amount of Romano-British and medieval pottery (James & Whittick 2008: 4).

Several survey projects through the 1980s did not result in any recorded artefact finds (Taylor *et al.* 1990; James & Whittick 2008: 4; Holland 2011: 6).

1990s and 2000s

The last 25 years have seen a series of watching briefs, mitigation projects, survey reports, and geophysical prospection within the property at Bodiam. Most of

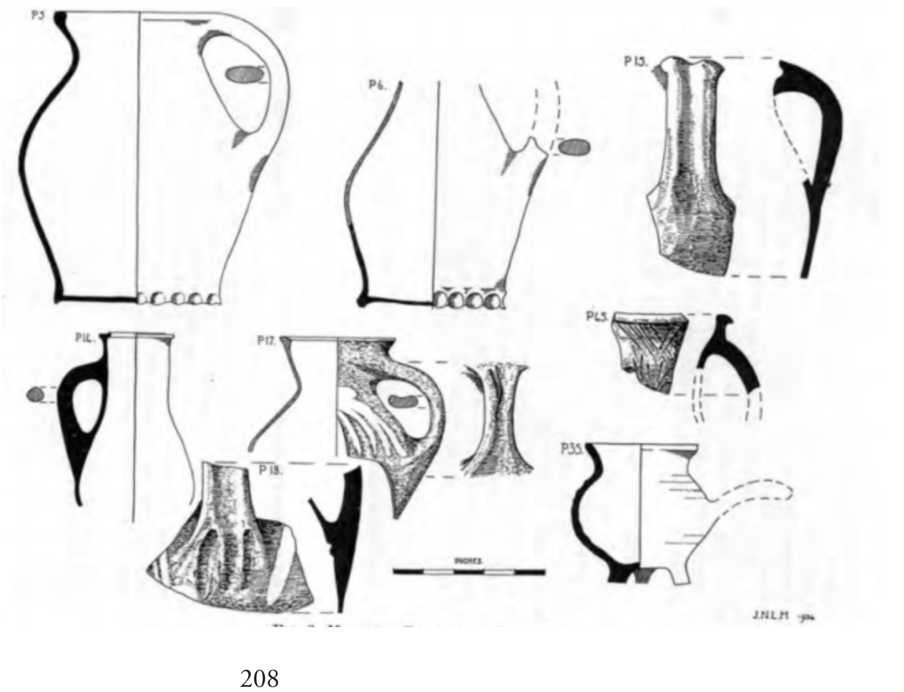

Fig. A1.2: Selection of pottery finds from Curzon's excavations. Reproduced from Myres (1935: 224).

Fig. A1.3: Selection of Roman-period finds, now held at the Battle Museum. Image courtesy of Battle Museum,. Photo by Kathryn Catlin.

these have been undertaken by Archaeology South-East (ASE), with the exception of a recent geophysical survey carried out by the University of Southampton/Northwestern University (this volume). Watching briefs in 1995 (Priestley-Bell), 1996 (Speed), 1999 (Johnson), 2002 (C. Johnson), and 2003 (Johnson) do not appear to have resulted in any finds.

In 1995, ASE sectioned part of the moat bank in order to describe its stratigraphy prior to alterations to the bank and visitor pathways (Stevens 1999). Limited finds dated from the Mesolithic (one flint core) to the 20th century (one 1936 penny).

A 1998 (Barber) watching brief on the installation of a new sewage treatment plant near the car park resulted in a relatively large collection of finds, mostly from the 18th and 19th centuries, but some tile, earthenware, and other artefacts most probably date to the late 15th or 16th century. A single pottery sherd dates to the late 13th century.

A 2007 (Barber 2007a) watching brief on drainage works recovered some Roman tiles, 14th-15th-century pottery and some 17th-century debris (Priestley-Bell & Pope 2009).

A further 2007 watching brief (Barber 2007b) followed the collapse of a portion of the moat bank and the loss of several trees during a storm. At the same time, the interior of the hall of the castle was partially excavated in advance of laying a new gravel surface to support visitor traffic. Small amounts of pottery, tile, glass, and other finds from the 17th-20th centuries were recovered.

In 2009 ASE carried out an evaluation of the Rose Garden (the two lots to the north of the modern tea room) prior to additional drainage and sewage works. Finds ranged from the 6th to the 20th century, including timbers and leather dated to the 6th century, and assorted pottery and tiles (Priestley-Bell & Pope 2009: 17).

A second watching brief in 2009 related to the extension of the car park (Grant *et al.* 2009) resulted in a small box of finds, mostly from the 16th-19th centuries.

Some surface finds were collected during an independent geophysical survey of the Roman road through Dokes Field in 2010 by the Hastings Area Archaeological Research Group (Cornwell *et al.* 2010). These included Roman iron, a Mesolithic flint, and some 14th-century ceramics.

Find Locations

The majority of finds are in storage or on display at Bodiam Castle. These include the majority of Curzon's finds, finds from the 1970 moat excavation, assorted individual finds from the property and wider landscape, and finds from the 1998 sewage project. Also at the castle are a collection of Roman finds, the pre-Roman urn discovered in 1902, and a large collection of tiles. The castle's collection may also include finds from earlier excavations that have been merged with those of Lord Curzon, as well as finds from recent Archaeology South-East projects that have been remitted to the National Trust. Records stored at the castle include a finds catalogue compiled by Gardiner and Barber in 1994 and four boxes of accession cards and photos, documenting both finds and paper archival records as of c. 1989.

Battle Museum of Local History holds numerous Romano-British finds from the 1960s excavations at Bodiam.

Hastings Museum and Art Gallery holds a box of finds from the Bodiam Moated Homestead site (Martin 1990), as well as some finds from excavations in the 1960s, from the Roman road and/or medieval features (e.g. anonymous 1959-60; Lemmon 1960-61; Lemmon & Darrell Hill 1966; Puckle 1960; Walling pers. comm. 12th August 2013). It may also hold at least one of Fuller's fundraising medallions (Bailey pers. comm. 7th August 2013).

The Royal Artillery Museum houses the mortar that was found in the moat at Bodiam during the early 18th century.

Collections from several excavations and watching briefs between 1990 and 2010 may be held at the ASE archives or at a local museum (e.g. Grant *et al.* 2009: 8).

The Finds in Context

Each individual component of the finds collection is small. This is typical of sites like Bodiam, where excavation and artefact collection have largely occurred on an as-needed basis. Taken together, the assemblage comprises an invaluable resource for developing a narrative of the lives, occupations, and priorities of those who lived in and around Bodiam over the past two millennia. The finds provide a potential glimpse into the minutiae of day-to-day, ordinary encounters with objects, and can therefore serve as a fundamentally material way to address the long-term rhythms and cycles of work across the landscape of Bodiam.

The scope of the project reported in this volume did not include an in-depth analysis of the finds. However, several possible future projects might incorporate the finds into an integrated analysis of Bodiam's history and landscape. The finds have the potential to expand and enrich what is known about the history of Bodiam and its landscape, including the importance of the river Rother to the Roman period settlement and trade, the economics and practicalities of daily life on a medieval English manor, and the recent history of the site's excavation and its use as a popular destination for tourism, recreation, and education.

Together with published environmental and landscape reconstructions of the Rother Valley and the Bodiam property (this volume; Burrin & Scaife 1988; Waller *et al.* 1988; Pope *et al.* 2009; Priestley-Bell & Pope 2009; Barker *et al.* 2012), the finds enrich the existing narrative of environmental and social change to build a more complete picture of the combined social and environmental landscapes of Bodiam. The finds include a variety of items from around the world, marking medieval Bodiam as a site of international commerce. The pottery and tiles may hold particular potential, if they can be sourced stylistically, chemically, or by thin-section analysis. Were the tiles imported from a significant distance? Or were they perhaps produced on site during the construction of the castle? Excavation to the south-west of the castle might suggest whether there is any connection between the tiles and the magnetic dipolar anomalies seen in the geophysics (this volume; Barker *et al.* 2012). Finds from excavations in the Roman harbour and the medieval flote could show how trade and consumer behaviour changed over time, likewise shedding light on the changing connections between Bodiam and the rest of the world. The post-medieval finds may suggest the extent of Bodiam's involvement with the Atlantic trade, and can bring to light the experiences of those who worked upon and enjoyed the picturesque landscape in the 19th and early 20th centuries before the National Trust's stewardship began.

Examinations of individual faunal assemblages have so far concluded that each collection is too small to be of interest (e.g. Priestley-Bell & Pope 2009: 21). If the collections were taken together, an examination of the combined faunal assemblage might show illuminating instances of butchery marks or presence of certain species at a particular time even if minimum counts or statistical analyses are not feasible. If available, a comparison with the finds collections of another estate of similar size and date, such as Scotney or Iden, would help to contextualise Bodiam's place within the social world of medieval East Sussex and Kent.

The excavation, distribution, and organisation of the finds over the last hundred years adds a modern component to the biographies of the objects in the collection. The history of the collections tells an interesting story about the changes in archaeological and curatorial practice over the course of the 20th century, both in terms of scientific methodologies and the kinds of artefacts and other evidence that have been deemed sufficiently interesting and informative to keep, store, and display, as well as the research priorities of the various supporting institutions. Numerous individuals who have worked with the Bodiam material, including for example Curzon and J.N.L. Myres, are significant figures in the development of medieval archaeology over the course of the 20th century.

The existing finds hold significant potential for the development of a multi-faceted research project that would explore medieval economies and practices, changes in the perception of the landscape over time, and the changing nature of archaeological and curatorial practices in the 20th century. Additional finds that might result from future excavation would add to the research potential of the collection, whether necessary watching briefs or more extensive archaeological investigation (see Drury & Copeman 2016).

APPENDIX 2

A LAYPERSON'S ACCOUNT OF SURVEY TECHNIQUES

Kathryn A. Catlin, Kristian Strutt[1]

A number of different survey techniques can be applied by archaeologists to record the signatures of surface and sub-surface archaeological structures, remains, and features. The survey work reported on in this volume included both topographic and geophysical survey tied to high accuracy Global Positioning System measurements. Geophysics included magnetometry, earth resistance, and Ground Penetrating Radar techniques, all explained below. These techniques were variously carried out at all four primary research sites, and the results are described in Chapters Three and Four (Bodiam), Six (Scotney), Seven (Knole), and Eight (Ightham Mote).

The different techniques described below each have their strengths and weaknesses. Each is particularly suitable for picking up certain kinds of features. Consequently, archaeologists often prefer to use a range of different methods in combination.

Magnetometer survey is generally chosen as a relatively time-saving and efficient survey technique (Gaffney *et al.* 1991: 6), suitable for detecting kilns, hearths, ovens and ditches. Magnetometry can also detect walls, especially when ceramic material (tiles, bricks) has been used in construction. In areas of modern disturbance, the technique is limited by distribution of modern ferrous (iron-rich) material. Earth resistance survey (sometimes termed resistivity survey), while more time consuming, is generally successful at locating walls, ditches, paved areas, and banks. The application of resistivity tomography allows such features to be recorded at various depths along a linear transect. In addition Ground Penetrating Radar (GPR) is useful for surveying material where sufficient change in the 'permittivity' (resistance to an electric field) of different features provides contrast, including walls, banks, ditches, pits and other types of archaeological feature.

In this work, we also undertook close contour topographic survey over areas of prospection, to record any important archaeological features that are apparent in the present land surface, and also to provide vital information on variations in the ground surface to aid analysis of the geophysical prospection results.

Survey work is generally carried out by archaeologists as part of an integrated survey strategy, designed to affiliate all the results of the geophysical survey techniques to the same grid system. Surveys are normally based on an arbitrary grid coordinate system, tied into a national system or to a series of hard points on the ground corresponding to points on a map. A set of 30 m grids are then set out in which to carry out the magnetometry, earth resistance, and other survey techniques such as fieldwalking and geochemical sampling. The topographic and geophysical data were processed in the

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1 The text in this appendix is adapted from the standard text used in reports of Archaeological Prospection Services of Southampton (APSS, directed by Kristian Strutt; see http://www.southampton.ac.uk/archaeology/research/groups/archaeological_prospection_service_southampton.page and the survey blogs at https://generic.wordpress.soton.ac.uk/archaeology/archaeological-prospection-services-of-southampton-apss/). Kathryn A Catlin did most of the revisions and further text, with further edits by Matthew Johnson and Kristian Strutt.

Fig. A2.1: Kristian Strutt engaged in topographic survey using RTK GPS at Bodiam Castle in 2010. Photo by Timothy Sly.

software packages Geoplot, GPR Slice, and Res2DInv, and imported into the Geographical Information Systems software ArcGIS for analysis. For technical details of the processing, see Barker *et al.* (2012).

Topographic Survey

The modern surface topography – humps and bumps on the ground surface, often more or less visible in different light conditions and from different heights and angles -- contains important information on the conditions and nature of an archaeological site or landscape, and can suggest the presence and location of structures or other features buried beneath the soil (Bowden 1999). The changes in topography can also have a great influence on interpretation of anomalies and features observed in a geophysical survey. Therefore it is often vital as a first step to produce a detailed and complete topographic survey as part of the field survey of any given site. This generally entails the recording of elevations across a grid of certain resolution, for instance 5 or 10 m intervals, but also the recording of points on known breaks of slope, to emphasis archaeological features in the landscape.

To record the survey points, we used a Real Time Kinetic (RTK) Global Positioning System (GPS) with a rover and base station (Fig. A2.1) as well as a Leica TC 307 total station (Fig. A2.2). Readings were taken every 5 m, and also on the breaks of slope of important topographical features. Computer software (ArcGIS) was then used to produce Digital Elevation Models (DEMs) of the results.

Earth Resistance (Resistivity) Survey

Earth resistance survey is based on the ability of sub-surface materials to conduct an electrical current passed through them. All materials will conduct electricity to a greater or lesser extent. Differences in the structural and chemical make-up of soils mean that there are varying degrees of ground resistance to an electrical current (Scollar 1990; Clark 1996: 27). Resistance meters pass an electrical current through the ground, and compare the resistivity at point locations in the grid with that of a distant background reading between two potential probes to measure variations in resistance over a survey area (Figs A2.3 & A2.4). Resistance is measured in ohms (Ω), whereas resistivity, the resistance in a given volume of earth, is measured in ohm-metres (Ω m). Electrical profiling usually employs two current and two potential probes (Gaffney *et al.* 1991: 2). We used a Geoscan Research RM15 Resistance Meter in twin electrode probe formation. This array represents the most popular configuration used in British archaeology, usually undertaken with a 0.5 m separation between mobile probes (Gaffney *et al.* 1991; Clark 1996).

Features picked up in this manner can be close to the ground surface. A twin probe array of 0.5 m spacing will rarely recognise features below a depth of 0.75 m (Gaffney *et al.* 1991). More substantial features may

Fig. A2.2: Peter Harris, Ceri Bridgeford, and Patrick Thewlis conduct topographic survey using a Leica TotalStation at Ightham Mote in 2013. Photo by Timothy Sly.

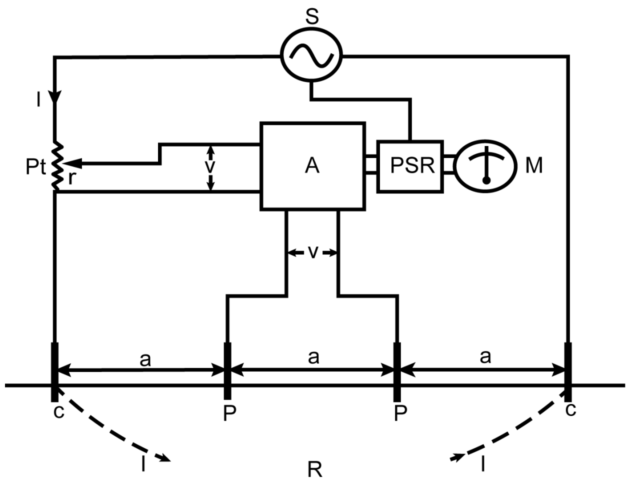

Fig. A2.3: The basic four probe circuit of a resistance meter (after Clark 1996: 27). Current (I) is produced at the AC source (S), passes through the potentiometer (Pt) and is introduced to the ground at electrodes C. The potential gradient is sampled between electrodes P, and the voltage (V) between them is applied to the amplifier (A) and displayed on the meter (M) along with the resistance (R). The phase-sensitive rectifier (PSR) reduces interference between the internal power sources and the signal being measured.

Fig. A2.4: Dominic Barker supervises earth resistance survey at Bodiam Castle in 2010. Photo by Timothy Sly.

register up to a depth of 1 m. The earth resistance survey in this volume was done to a resolution of 1 or 0.1 Ω , with readings every metre or half metre. For this project, data were collected bi-directionally in 30 m grids at 0.5 m intervals with a transect spacing of 0.5 m.

In general, higher resistance features are interpreted as structures which have a limited moisture content, for example walls, mounds, voids, rubble filled pits, and paved or cobbled areas. Lower resistance anomalies usually represent buried ditches, foundation trenches, pits and gullies. A number of factors may affect interpretation of twin probe survey results, including the nature and depth of structures, soil type, terrain, and localised climatic conditions. Changes in the moisture content of the soil, as well as variations in temperature, can affect the form of anomalies present in earth resistance survey results. Non-archaeological features are also detected by resistance meters, which can complicate the interpretation of results.

Electrical Resistivity Tomography

Electrical Resistivity Tomography (ERT) measures the resistivity of the soil matrix and buried materials. It works in a similar manner to the RM15 Resistance Meter discussed above, except that it employs multiple probes. Readings are recorded along a single transect in successively deeper traverses, enabling the device to sense features that are much more deeply buried. The result is a profile view of soil resistivity at multiple depths along a single transect (Figs A2.5 & A2.6). The ERT survey at Bodiam employed an Allied Associates Tigre 64-probe system, with probes spaced at either 1, 2, or 3 m intervals depending on the particular context of the transect. This allowed us to measure resistivity to nearly 20 m below the ground surface along a linear distance of approximately 550 m.

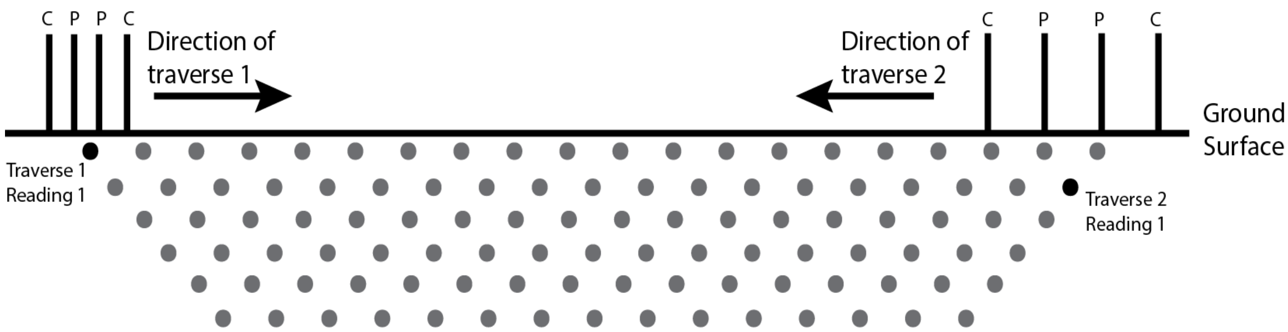

Fig. A2.5: Diagram of an Electrical Resistivity Tomography (ERT) survey. As in Fig. A2.3, the current is introduced to the ground at electrodes C and the voltage potential is measured at electrodes P. See also Fig. 4.6, this volume.

Fig. A2.6: ERT survey in progress at Bodiam in 2010. Photo by Matthew Johnson.

Magnetic Survey

Magnetic prospection of soils is based on the measurement of differences in magnitudes of the earth's magnetic field at points over a specific area. The iron content of a soil provides the principal basis for its magnetic properties. The presence of magnetite, maghemite and haematite iron oxides all affect the magnetic properties of soils. The overall strength of the earth's magnetic field is around 48,000 nanoTeslas (nT). Variations in the earth's magnetic field which are associated with archaeological features are relatively weak in comparison, but they can be detected using specific instruments (Gaffney *et al.* 1991; Fig. A2.7).

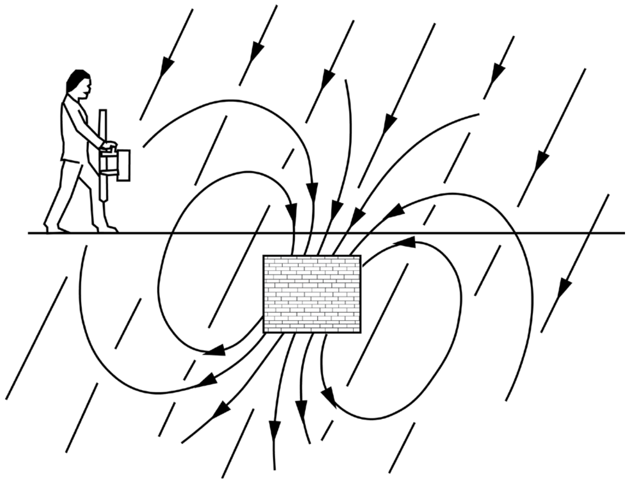

Fig. A2.7: The effect of the earth's magnetic field (straight lines) and the local magnetic field generated by buried material (curved lines), measured during magnetometer survey (after Clark 1996, fig. 50).

The work reported on in this volume used a dual sensor Bartington Instruments 601-2 fluxgate gradiometer (Fig. A2.8). The instrument measures changes in the Earth's magnetic field by comparing the strength of the magnetic field induced in two highly permeable nickel iron alloy cores held at a vertical separation of 0.5 m. The nickel iron cores are magnetised by the earth's magnetic field, together with an alternating field applied via a primary winding (Scollar 1990: 456). Due to the fluxgate's directional method of functioning, a single fluxgate cannot be utilised on its own, as it cannot be held at a constant angle to the earth's magnetic field. Gradiometers therefore have two fluxgates positioned vertically to one another on a rigid staff. This reduces the effects of instrument orientation on readings. Fluxgate gradiometers are sensitive to 0.5 nT or below depending on the instrument. They can rarely detect features which are located deeper than 1 m below the surface of the ground.

Magnetometry is best at detecting metallic objects, as well as non-metallic features that have been exposed to high enough temperatures that molecular bonds begin to relax, allowing the magnetic moment of any ferrous content to realign to magnetic North. This includes bricks and other burnt features such as hearths and

Fig. A2.8: Eric Johnson and Meya Kellala conduct magnetometer survey in Dokes Field at Bodiam Castle in 2012. Photo by Kathryn A Catlin.

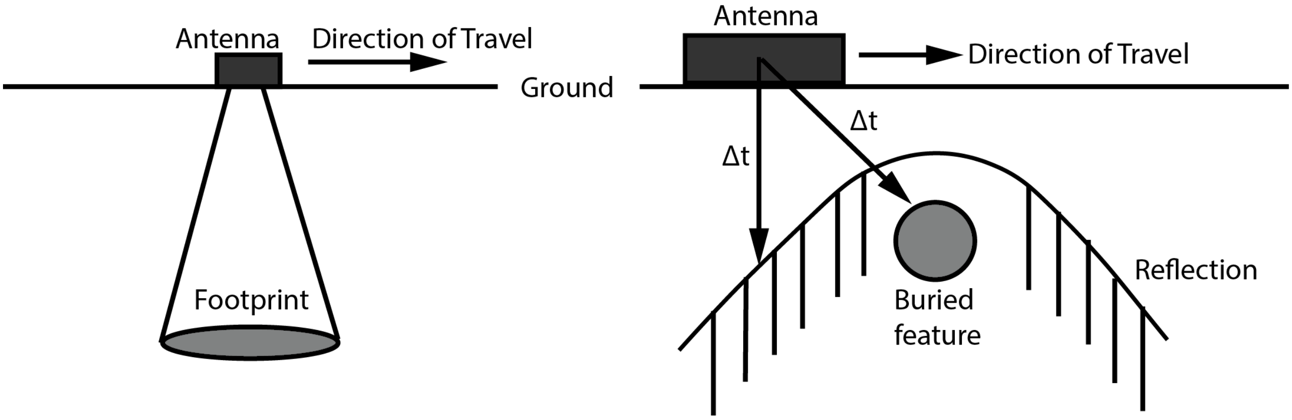

Fig. A2.9: Diagram showing the footprint of a GPR antenna as the radar wave propagates through the ground, and the reflection caused by a circular or oval body located below the surface of the ground as the antenna passes over it.

kilns. Gradiometers also detect the enhanced magnetic susceptibility of anthrosols (topsoils that have gained ferrous material via proximity to human habitation). Buried pits and ditches, where topsoil has infilled a trench dug into less magnetically susceptible subsoil, are therefore also readily detectable by magnetometry techniques under the proper conditions (Aspinall *et al.* 2008). Results are extremely dependent on the geology of the particular area, and whether the archaeological remains are derived from the same materials. Because gradiometers detect magnetic fields, they are particularly sensitive to iron and other metals in the survey area. It can be difficult to distinguish between archaeological materials, modern disturbances or refuse, and naturally occurring iron-rich deposits, such as the peat encountered during our Bodiam survey. Magnetometry data was collected bi-directionally in 30 m grids at 0.25 m intervals with a transect spacing of 0.5 m.

Magnetic Susceptibility Survey

Magnetic susceptibility surveys ('mag sus') were carried out with a Bartington Instruments MS-2 on a 10 m grid. Magnetic susceptibility meters create an alternating magnetic field at a point location and measure the resulting flux density, similar to a metal detector. Susceptibility surveys were intended to supplement the gradiometer data and train students in the technique.

Ground Penetrating Radar Survey

Ground Penetrating Radar (GPR) survey is based on the use of electromagnetic waves propagated through the soil to detect changes in density and composition, including the presence of buried objects. Interfaces between buried materials of different density and dielectric permittivity cause a portion

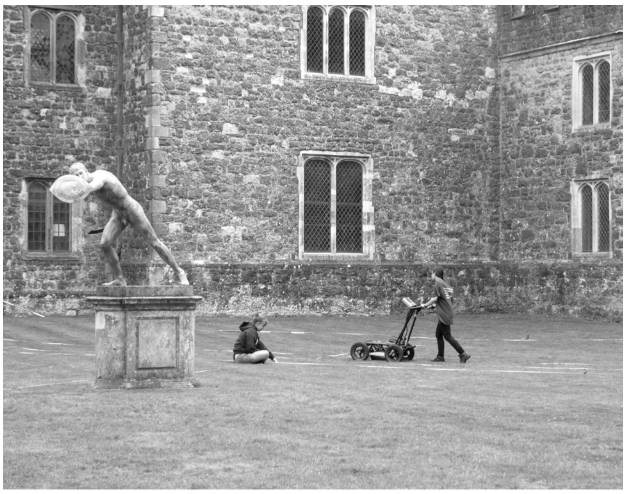

Fig. A2.10: Katie Fuller and Helena Glover conduct GPR survey in the Green Court at Knole in 2013 using a 500 MHz Sensors and Software Noggin Plus. Photo by Matthew Johnson.

Fig. A2.11: Ivan Yeh, Emily Pierce-Goldberg and Chen Xiaowen conduct GPR survey in 2012 at the Bodiam cricket field using a 200 MHz GSSI instrument. Photo by Kathryn A Catlin.

of the energy to reflect. Energy that reflects off of deeper buried reflectors will take more time to return to the instrument. The time between the generation of the radar wave at the antenna and the return of its reflection to the receiver is measured in nanoseconds (ns) and once the signal velocity is calculated this can be translated into depth (Fig. A2.9). GPR is therefore able to produce a three-dimensional model of buried objects and features of differing density from the soil matrix. Rocks, walls, pits, pathways, and buried solid objects are good targets for GPR prospection. Lower frequency antennas have higher energy and can penetrate deeper into the ground, depending on soil conditions. A 500 MHz sensor can penetrate up to a few metres, depending on the soil conditions, while a 200 MHz sensor is better at detecting deeper materials and bedrock formations. GPR surveys primarily employed a 500 MHz Sensors & Software Noggin Plus with a SmartCart frame and console, along 0.5 m uni-directional transects (Fig. A2.10). The 2012 GPR survey on the Bodiam cricket field used a 200 MHz GSSI sensor, bi-directionally with 0.5 m transects (Fig. A2.11).

APPENDIX 3

FURTHER DETAILS OF ENVIRONMENTAL METHODS

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Chapter Five discusses the long-term environmental history at Bodiam, and Chapter Twelve discusses environment, ecology and human habitation more generally. The evidence discussed in Chapter Five came from a series of soil cores taken around the Bodiam landscape.

Once extracted and in the laboratory, cores can be analysed in various ways. They can be examined visually to look for particular kinds of sediment of other material. Different materials such as humic peat can be observed, or the traces of made-up ground or old land surfaces can be apparent. Any organic material such as peat or charcoal can be used for radiocarbon dating. Pollen can be extracted from the core by chemical treatment of soil samples, and the different species, types and proportions of pollen suggest what plant species were growing in the locality. Different species, of course, thrive in different conditions, so this information in turn can be used to infer different local conditions (wet, dry) or different climatic regimes (warm, cold).

Several sediment cores were extracted from the grounds at Bodiam Castle for stratigraphic and palynological analysis to reconstruct the changing environmental context of the Bodiam landscape through the Holocene. The results of the analysis are described in Chapter Five. On 8th May 2013, seven profiles were extracted by a University of Southampton team consisting of Dominic Barker, Penny Copeland and James Miles, along with Victoria Stephenson of University College London. The cores were located within the castle (A1 & A2), in the fill of an adjacent pond (F), sediment underlying the moat bank (D), the car park (B) and the east yard (C1 & C2; see Fig. 5.1). Coring samples were obtained from A1, A2, B, C1, C2, and D using a Cobra two-stroke pneumatic power corer with 1 m tubes; the diameter of the core tapers from 8 to 40 mm, decreasing with depth. All Cobra samples except A1 employed a plastic sleeve to transport the section to the wet laboratory at the Department of Archaeology, University of Southampton for further description and analysis. The pond sample, site F, was obtained using a 0.5 m diameter Russian/Jowsey peat corer due to the very wet nature of the soils (Fig. 5.11), and these samples were chill stored in half sectioned plastic drain pipes prior to sediment description and sampling in the laboratory.

Two radiocarbon samples were dated by Beta Analytic Inc. We planned to investigate a further location (E) corresponding to the Roman road through Dokes Field, but due to time constraints, were unable to do so.

Sediment Analysis

A range of sediment types was recovered, including humic peat and sediment with clear potential for pollen analysis, palaeoenvironmental reconstruction, and radiocarbon dating. Made ground and old land surfaces were also observed, the latter also sampled for pollen analysis to provide a picture of the vegetation and possible land use on and very near the site. The

1 This appendix was prepared by Kathryn A Catlin, from original text by Rob Scaife and Penny Copeland.

characteristics of these profiles are detailed in Tables 5.B-5.G, including colour descriptions as standard Munsell in natural light.

Pollen Analysis

Standard pollen extraction techniques were used on sub-samples of 2 ml volume (Moore & Webb 1978; Moore *et al.* 1991). A sum of 400-500 pollen grains, including dry land taxa plus extant marginal and aquatic taxa, fern spores and miscellaneous palynomorphs, were identified and counted for each sample level. Chemical preparation procedures were carried out in the Palaeoecology Laboratory of the School of Geography, University of Southampton and identification and counting was carried out using an Olympus biological microscope fitted with Leitz optics. Standard pollen diagrams (see Chapter Five) were constructed using Tilia and Tilia Graph.

Pollen percentages were calculated for the sum and sub-groups as follows:

Sum	=	% total dry land pollen (tdlp)
Marsh/aquatic herbs	=	% tdlp + sum of marsh/aquatics
Ferns	=	% tdlp + sum of ferns
Misc	=	% tdlp + sum of misc. taxa (Sphagnum moss, pre-Quaternary palynomorphs and other micro-fossils).

Alnus has been excluded from the pollen sum because of its high pollen productivity (and consequent abundance) and growth on or near the site, which tends to distort the percentage representation of other taxa within the pollen sum (Janssen 1969). Consequently, the percentages of alder have been incorporated within the fen/marsh group of which it is botanically a part. Because *Salix* may be associated with this fen carr taxon/habitat, it was also included in this calculation. Taxonomy, in general, follows that of Moore & Webb (1978) modified according to Bennett *et al.* (1994) for pollen types and Stace (1992) for plant descriptions.

Scientific and Common Names of Observed Taxa

Acer	Maple
Alisma plantago-aquatica	Water plantains
Alnus glutinosa	Alder
Asteraceae	Daisy (aster) family
A. Bidens	Beggarticks
A. Anthemis	Chamomile
A. Artemisia	Wormwood genus
Betula	Birch
Caltha palustris	Marsh marigold
Cannabis sativa	Hemp
Carpinus betulus	Hornbeam
Caryophyllaceae	Carnation family
C. cerastium	Chickweed
C. dianthus	Carnation genus
Centaurea	Knapweeds
Chenopodiaceae	Goosefoot family
Corylus avellana	Hazel
Cyperaceae	Sedges
Dryopteris	Wood fern
Erica	Heather/heath
Euonymous	Spindle
Fagus sylvatica	Beech
Frangula alnus	Alder buckthorn
Fraxinus	Ash
Hedera helix	Ivy
Ilex	Holly
Iris	Iris
Juglans regia	Walnut
Lactucoideae	Dandelion subfamily
Lysimachia	Loosestrife
Nymphaea alba	White water lily
Osmunda regalis	Royal fern
Pediastrum	Algae
Picea	Spruce
Pinus	Pine
Poaceae	Grasses
Polypodium vulgare	Polypody fern
Plantago lanceolata	Ribwort plantain
Pteridium aquilinum	Eagle fern (bracken)
Quercus	Oak
Ranunculaceae	Buttercup family
Rhamnus cathartica	Buckthorn
Secale cereal	Rye
Salix	Willow
Sinapus	Mustard
Sparganium	Bur-reed
Sphagnum	Peat moss
Succisa	Succisa
Tilia cordata	Lime (linden)
Typha angustifolia	Cattail/reed mace
Ulmus	Elm
Viburnum	Viburnum