The Archaeology of Prehistoric Burnt Mounds in Ireland

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Front cover: Burnt mound (SMR: CO102-005013) in the townland of Ardgroom Outward, Co. Cork (Photo: Nick Hogan)
Back cover: Top – bottom: Drombeg stone-lined trough (Photo: Edward Fahy, courtesy of Dan Breen); reconstructed cooking trough and burnt stone mound (Photo: author); excavation of a trough at Bockagh, Co. Roscommon (Photo: IAC Ltd); heat-shattered/affected stone (Photo: author)

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Preface

The ability to control fire has continuously developed over the long history of human evolution. Modern humans and preceding hominins have used fire since the Lower to Middle Pleistocene, dating as far back as 200,000 to 1 million years ago (see Wu 1999; Goren-Inbar *et al*., 2004; Zhong *et al*., 2014; Gao *et al*. 2014). However, the discovery of Upper Paleolithic burnt stone deposits at El Mirón Cave, Spain along with similar deposits at Shuidonggou, near Yinchuan, China, indicate that humans ability to control and use fire underwent considerable change *c.*15-10,000 years ago, evolving from direct contact between fire and a heated object to indirect heat transfer using hot stones (Nakazawa *et al.* 2009; Gao *et al*. 2014).

The stone represents the waste-firing material associated with a 'pyrolithic' technology, where stones were heated and then rapidly cooled through immersion in cold water, although features employing dry heat are also known in the archaeological record. The antiquity and utility of pyrolithic technology is attested to by the presence of burnt stone in archaeological sites dating back thousands of years. Ethnographic records from different parts of the world illustrate the importance of using hot stones. This technology was commonly used in cooking facilities to indirectly cook food via stone boiling, earth oven baking and griddle roasting, while hot stones were also used to provide heat in shelters.

While pyrolithic technology was in wide use since the Upper Palaeolithic, in Ireland it is particularly associated with water-boiling during the Bronze Age. The method involved a process of heat transfer whereby water was boiled in sunken pits (troughs) through the introduction of stones heated in a nearby fire. The heat transferred directly from the stones, raising the water to the necessary temperature. After numerous re-firings these stones eventually shattered by the heating/cooling process, and gradually accumulated near the trough to form a low mound or spread that contained large amounts of charcoal. These *fulachtaí fia*, as they are known in Ireland, are recognised in the field as crescent-shaped mounds of burnt stone, or are exposed in plough-soil as spreads of burnt stone mixed with charcoal-enriched soil. With an estimate 7000 examples known, it seems that Ireland was the most prolific user of pyrolithic technology in Bronze Age Europe.

This book presents and discusses the archaeology of burnt mounds in Ireland. These deposits have been regarded as somewhat enigmatic, described by one researcher as 'one of the most boring sites with which a field archaeologist must deal' (Barber and Russel-White 1990: 59). Burnt mounds are prominent in the literature, yet most discussions have been based on a small sample of the available evidence. This has happened for two reasons. The first is that the number of excavations has increased considerably as a result of development-led archaeology over the past twenty years. The other is that the results of relatively few of these projects have been published, mostly site specific outputs focusing on the excavated features rather than clear interpretive discussions.

The book presents a re-evaluation of the burnt mound phenomenon in light of some 1000 sites excavated in Ireland. This is the most comprehensive study undertaken on the use of pyrolithic technology in prehistoric Ireland, dealing with different aspects of site function, chronology, social role and cultural context. A number of key areas have been identified in relation to our understanding of these sites. Previous investigations of burnt mounds have provided little information on the temporality of individual sites. It has been established that appropriate sampling strategies can provide important information about the formation of individual sites, their relationships to each other and to other monuments in the same cultural landscape. The evidence suggests that considerable caution should be exercised with regard to certain single radiometric dates from burnt stone deposits, based on the association between the dated sample and the pyrolithic activity in question. Previously regarded as Bronze Age in date, there are now numerous examples of pyrolithic-type processes in earlier contexts, with the origins of the water-boiling phenomenon now considered to lie in the Early Neolithic period.

A review of recent excavation evidence provides new insights into the use of pyrolithic technology for cooking. This is based on the discovery of faunal remains at several sites, combined with insights gained through experimental studies. The model proposed here is of open-air communal feasting and food sharing hosted by small family groups, as a medium for social bonding and the construction of community. It is also argued that if cooking was the primary activity taken place at these sites, this should not be viewed as a mundane functional activity, but rather one that actively contributed to the constitution of social relations.

Alan Hawkes 2016

Chapter 1

Burnt mounds: an introduction

Spreads and low mounds of burnt stone and charcoal-enriched soil, are one of the most common types of site found in prehistoric landscapes. They represent an accumulation of firing material associated with a pyrolithic technology, which involved a process of heat transfer that centred on the use of hot stones immersed in water-filled troughs or placed in small, lined/unlined pits/ovens. Hot stones were also used to generate steam for sweat-bathing, a practice widespread in many parts of the world in prehistoric and later times. The use of this technology extends back tens of thousands of years to when humans began to control and manipulate fire for the purpose of heat transfer. It gradually evolved to play and important role in the development of cooking procedures in many parts of the world, where hot stones were used for prolonged cooking by roasting, steaming and boiling in different types of pits. Through thermal conduction, stones capture and hold the heat generated by fast-burning fuel that would otherwise dissipate before many foods could be cooked over open flames (Thoms 2008; 2009). The use of these 'indirect' methods of cooking did not mean the replacement of older 'direct' methods. While more costly techniques, such as pyrolithic water-boiling (in terms of heat expended and labour invested), were occasionally used in certain societies, less costly, open-fire methods continued to be used for easily cooked foods.

In Bronze Age Ireland, pyrolithic water-boiling was particularly popular, with material from this process purposefully deposited in small crescent-shaped mounds, usually adjacent to a convenient water source such as a stream, river or spring. These burnt mounds have been the subject of archaeological enquiry since the early 1800s in Ireland. Designated '*fulacht fiadh*', they were described as ancient cooking places or 'deer roasts' (Hackett 1854); an interaction supported by references to apparently similar sites in early literature, notably, Geoffrey Keating's *Foras Feasa ar Éirinn* (Dineen 1908). Their wider cultural meaning remained largely unexplored until the 1980s (Ó Drisceoil 1988; Buckley 1990).

During the early 1990s, burnt mounds acquired an unfortunate name as one of the 'most boring sites with which a field archaeologist must deal. Apart from new data and a new spot on the distribution map, individual sites have little to contribute to our understanding of the past' (Barber and Russel-White 1990: 59). This viewpoint probably still illustrates a general attitude of many field archaeologists working in Ireland and Britain. This is partly due to the perceived similarity of these sites when excavated and the general absence of diagnostic material culture. Of most relevance, however, are problems relating function, first remarked upon by Rev. Richard Smiddy who observed that; 'The name *folach fiadh* is well known to the country-people: and they bestow it on a heap of burnt stones, of which, as a rule, they know neither the origin nor the use' (Smiddy 1873: 52). Despite the level of investigation and experimentation that has taken place, the ambiguities surrounding these sites have remained. In fact, the myriad of functional theories now apparent in the published literature has resulted in burnt mounds being, rather unhelpfully referred to as the 'kitchen sink of the Bronze Age'. The picture that has emerged is one of a multi-period site of a multi-functional nature associated with mundane water-boiling tasks. As such, burnt mounds have not been incorporated into wider discussions on prehistoric archaeology and have rarely featured in syntheses of the European Bronze Age.

During the past 15 years, an upsurge in excavation led to renewed interest in the Irish burnt mound phenomenon (Ó Néill 2009; Hawkes 2012; 2014; 2015). They have become one of the best known and most frequently excavated site types in Ireland, largely as a consequence of numerous discoveries made in course of road building. By 2010 an estimated 1200 sites have been excavated, with some 900 as a result of infrastructure development, making this the most common archaeological site discovered during infrastructure and other projects. Much of this evidence excavation record can be regarded as 'grey literature', as most of these sites have not been published in a comprehensive manner. Even though this is slowly being amended through publication initiatives by Transport Infrastructure Ireland and other bodies, there has been no comprehensive review of the new dataset. This book will examine this new evidence for a site type known not only in Ireland but also in other parts of northern Europe. The compilation of this site information provides a better understanding of the archaeological record, and allows for a detailed analysis of the function and social significance of these sites, along with their chronological and cultural affinities.

While numerous site reports are available, there have been relatively few general studies of burnt mound archaeology in Ireland. M.J. O'Kelly's seminal paper in 1954 remains one of the most important early studies of burnt mounds in Ireland. In recent years the International Burnt Mound Conference would provide a forum for more open debate on matters relating to function (Buckley 1990). John Ó

Néill (2009) was the most recent researcher in Ireland to study the beginnings of the growing excavation record and was the first to explore the different processes involved in 'pyrolithic technology'. His work would also highlight the emerging trend among developers and archaeologists at that time, who were beginning to regard burnt mounds as somewhat generic and devoid of new information (Ó Néill 2000a).

1.1 PYROLITHIC TECHNOLOGY AND THE IRISH BURNT MOUND

In Ireland, the pyrolithic phenomenon is mainly associated with burnt mounds or *fulachtaí fia*, where it is generally assumed that a hot-stone, water-boiling technology was employed to heat water held in open-air sunken pits (O'Kelly 1954; Waddell 2000; Ó Néill 2009). They are usually situated in low-lying, poorly drained, marginal land close to a water source, such as a river, stream, spring, pond, lake, turlough bog or marshy area (O'Kelly 1954; Ó Drisceoil 1980; 1989; Waddell 1998; Grogan 2005; Ó Néill 2009). While the majority of sites are generally located at lower points in the landscape (0−60m OD), associated with poorer soils (Grogan *et al.* 2007: 88) some examples are known in upland areas (100−200m OD) (see O'Brien 2009), though rarely above 200m OD.

These sites are marked by the presence of one or more low mounds or spreads of heat-shattered stone and charcoal. This material often overlies one or more pits used as a water trough, along with accompanying hearth (s). Other features regularly found at these sites include wells and water-drainage features, pits, platforms/working surfaces, revetments, ancillary structures and trackways (see Chapter 4). The stones thermally fractured by repeated firings, followed by immersion in cold water, until they gradually disintegrated beyond a useable size. The resulting stone, along with the charcoal and remnants of the fire were removed from the trough and spread in the vicinity to form a low mound. The stony, free-draining nature of this burnt mound was not conducive to vegetation growth, with the result that they stand out clearly as grassy knolls in poorly drained areas (Figure 1.1). They have a varied form, but typically conform to a horseshoe shape. While the Archaeological Survey of Ireland does not account for the total number of extant burnt mounds in Ireland (with many considerably out of date), a significant sample is available for analysis. Of 1148 mounds described in the published archaeological inventories, 47% of sites exhibit a horseshoe, kidney or crescent shape, while 18% are circular, 17% irregular, 14% oval and 2% D-shaped. They range in size from 3−20m and are generally less than 1−2m in height (Figure 1.3). Situated in low-lying, poorly drained land, these mounds often occur in significant clusters, with groups of up to six or more being recorded, sometimes within a few metres of each other (Power 1990; Waddell 2000; Grogan 2005). While such clustering indicates a prolonged use of a particular location, little relatively is known of the temporality of this practise. Recent commercial archaeology projects have provided interesting results with regard to chronology, which has altered dramatically our understanding of such burnt mound concentrations (see Chapter 5).

Burnt mounds are the most numerous prehistoric site in Ireland, with recent indications suggesting that there are in excess of 7000 recorded examples (Figure 1.2). It is difficult to determine the true number as hundreds of unrecorded, levelled sites have been identified in recent years as a result of road building and other developments. They are most common in the south-west of the country, particularly in Co. Cork where some 3000 examples are recorded, occurring in a density of at least 1 per 3.7 sq. km (Ó Drisceoil 1987: 51; Buckley 1991: 3). It is likely however, that these densities are related to a bias in fieldwork rather than a genuine reflection of the distribution trends of the monument type.

Various terms are still used to describe these sites in Ireland. Hackett (1854: 59) observed they were known in Cork as '*Folacht Fia*' or 'Cooking Places', in Tipperary as 'Deer Roasts' and in Ulster as 'Giant Cinders' (see Chapter 2). The latter two terms do not seem to occur in the literature after the middle of the nineteenth century. The term '*fulacht fian*' has also been associated with a mythical band of warriors known as the Fianna. The latter term was popularised in the nineteenth century by Geoffrey Keating's text, *Foras Feasa ar Éirinn.* The name '*fulacht fiadh*' is a nineteenth-century invention meaning 'cooking place of the deer' or 'of the wild'. The word '*fulacht*' and its derivatives appear as a term relating to cooking from about the ninth century AD; however, early references are quite ambiguous and some have cautioned its use in relation to pyrolithic water-boiling (Ó Drisceoil 1990; Kelly 2000; Ó Néill 2005). The earliest recorded reference to the term '*fulacht*' occurred in Cormac's Glossary from approximately AD 900 (*ibid.*: 673). Many of the sources in which the term is found have their roots in oral tradition, making them difficult to date (Ó Drisceoil 1990: 157). Whether these early references refer to what we now class as burnt mounds is matter of continued debate (See Chapter 2; Chapter 5 and Chapter 8). Ó Néill (2005: 84) states that the true origin of the term might derive from words such as folach 'support' or fuil, fola 'blood' and may intentionally contain resonances of both. There is clearly an ambiguity in early Irish literature, whereby the references to this site-type are obscure and difficult to translate. Today, some archaeologists view the term '*fulacht fia*' as archaic, preferring to use 'burnt mound' in relation to pyrolithic technology.

The term 'boiling mounds', 'pot-boilers' and 'burnt mounds' are often reserved for similar British site-types, which are also characterised by mounds of heat-shattered stone and charcoal (Chapter 4). The term 'burnt mound' is increasingly applied to Irish examples, more so in recent years as a direct consequence of development-led projects. It is used in a broad sense to describe sites where charcoal-enriched soil and heat-altered stone is uncovered. Some researchers (e.g. Brindley *et al*. 1989−1990; Grogan *et al.* 2007) have used the term where a boiling trough or pit

Figure 1.1. Burnt mound at Turnaspidogy, Co. Cork (RMP CO081-044). Source: Alan Hawkes

is absent from the excavated site. 'Burnt spread' is also assigned to sites where a shallow spread of heat-shattered stone is uncovered, which may or may not overlie cut features. This can happen where the full extent of the site is not revealed; for instance, on a pipeline or road development.

Ó Néill (2009: 49) observed that any terminology must be based on the evidence provided by excavation. Where sites have not been excavated it is appropriate to use the term with least functional connotations (*ibid.*: 49). For Ó Néill, 'burnt mound' is the most neutral, and unlike *'fulacht fia*', does not suggest a particular function nor any pre-supposed connection to the historically documented tradition in Ireland. While this study confirms there is no archaeological evidence to support a burnt mound tradition contemporary with the historical sources (Hawkes 2012; see Chapter 5 and 8), it also revealed that the term '*fulacht*' and its derivatives refer to a cooking activity in some capacity, whether relating to cooking on a spit or in a boiling trough. With this in mind, it may be acceptable to continue with the term *fulacht fia* by reason of the literal translation of '*fulacht*,' meaning 'recess' or 'cavity' and '*fia(dh)*' meaning 'of the deer' or 'of the wild'; essentially, some form of outdoor activity relating to cooking in pits. The term 'burnt mound' has been used to distinguish sites without boiling pits. While terminology can provide a basis for distinguishing certain types of burnt mound site (Brindley *et al.* 1989−90), it does little to explain the differences now apparent in the excavation record. To avoid confusion, the term 'burnt mound' will be used throughout this book as a means to describe any site with a considerable deposit of burnt stone material, with or without accompanying cut features such as troughs.

The general consensus is that burnt mounds in Ireland were places were pyrolithic technology was practiced for the heating or boiling of water. The function of these sites, however, remains problematic due to the various applications of hot water. The lack of diagnostic material culture and faunal remains from most excavated sites also makes interpretation difficult. The suggestion that they were cooking sites is perhaps the most widely accepted of the many theories. Here, the primary purpose of the site was to cook food by means of heat-transfer from hot stones to water and then eventually to meat and other food. Due to the scarcity of food waste in excavated burnt mounds alternative suggestions have been put forward regarding their function, such as their use as bathing places or saunas, as well as brewing, textile-processing and leather working areas (see Chapter 6 for further discussion). In the absence of diagnostic artefacts, the dating of burnt stone deposits has mainly been approached through the use of radiocarbon dating. Anna Brindley and Jan Lanting

undertook a comprehensive programme of radiocarbon dating in the late 1980s, the results of which placed the use of most of these sites in the Bronze Age (Hawkes 2012). The large numbers of excavations in recent years, due to infrastructure and building developments has expanded the radiocarbon record for these sites.

1.2 BURNT MOUNDS: A NEW DIRECTION

O Néill (2009) was the first to recognise the potential for burnt mound research where large amounts of data might reveal answers to long-standing questions about the site type. Unfortunately many sites excavated during the Celtic Tiger years of commercial archaeology could not be included at the time of this research. The author's research has developed on O'Néill's important study to include new data coming from final reports including specialist information. The availability of this new information means this is the first study to consider the origins of the burnt mound phenomenon in Ireland, its use and social significance along with their relationship to contemporary settlement.

Research aims and Objectives

In addition to creating a comprehensive database of excavated sites, this study also aims to address the following:

(a) Burnt mound and infrastructure archaeology in Ireland

Over the past fifteen years burnt mounds and related deposits have been a major component of development-led archaeology in Ireland, with the likelihood that this will continue in future infrastructural schemes. Because they occur in large numbers with a range of similar features, there is a tendency within major infrastructural schemes to view burnt mounds as a homogenous group that add little to our understanding of prehistory. An analysis of excavation and sampling strategy employed on road and pipeline schemes will consider many problems associated with the investigation of these sites on such projects.

The range of excavated features in these sites will be studied with a view to understanding aspects of site formation. Whether all sites share the same basic characteristics and how variability in layout relates to function are two questions to be considered. Recent evidence suggests that the technology may have been used in different ways, with the result that morphologically similar site types employed similar pyrolithic techniques for different purposes. Burnt mound excavations have also produced evidence of activities carried out in a controlled, ordered environment. The structured deposition of mound material, the specific location of certain features and the control of water, suggests a level of design and maintenance that has not been explored in any detail. Questions of organization will be examined in relation to the occupation history and use of these sites.

(b) Chronology

This is a long standing issue in relation to burnt mounds. Prior to this study it was generally accepted that these sites have long use histories in Ireland, beginning sometime in the Early Bronze Age and dying out during the medieval period. There has been continued debate (O'Kelly 1954; Sheehan 1990; Walsh 1990; Edwards 1990; Brindley *et al.* 1989−1990) as to whether the tradition continues into the historic period, contemporary with the many of the early literary sources that describe similar processes. Radiocarbon dates from few sites have in the past been used to confirm that pyrolithic water-boiling continued into medieval times (Murphy and Clarke 2000; Ryan 1990). There has been a similar discussion of burnt mound chronology in Britain (Williams 1990: 134; Russell-White 1990: 75; Anthony 2003; Ó Néill 2009). With a large sample of excavated burnt mounds now available, these long standing questions on chronology can now be addressed. A critical analysis of new radiocarbon evidence will also shed some light on the origins and decline of this water-boiling technology in Ireland.

Researchers have generally ignored that these sites are commonly the product of many 'occupations'. There is relatively little information on the duration of individual sites. The nature of mound deposits generated by the use of pyrolithic technology means that detailed stratigraphic analysis is often not possible. Where evidence exists for multiple phases of use on a site, this is seen principally in the form of numerous pits and through the replacement, re-cutting and re-lining of troughs. The broader implications of these use-cycles will be explored, including the symbolic dimension to site histories and internal phasing, with the deliberate mounding of stone viewed as a creation of 'place' through culturally specific set of activities. It is, however, important to highlight the limitations imposed by archaeological methodologies, such as the difficulty in establishing the temporality of occupation. A site may have multiple lifecycles, however these might not always be recognisable due to poor stratigraphic differentiation and later disturbance. This is also complicated by the equivocal nature of the physical evidence, and the fact that the term burnt mound may cover a range of site types.

(c) Use and social significance

With some 7000 recorded burnt mounds, Ireland was probably the most prolific user of pyrolithic water-boiling technology in prehistoric Europe. Most discussions on the site type focus on function due to the many possible uses of hot water for everyday activities. In recent years, burnt mounds have been the subject of some controversy in popular media and academic circles. The large amount of data from recent excavations in Ireland has the potential to address long-standing research questions about site function. Although the cooking hypothesis is the most widely accepted, this has come under scrutiny due to the scarcity of food waste and artefacts. The recent discovery of animal bone assemblages at a number of sites provides

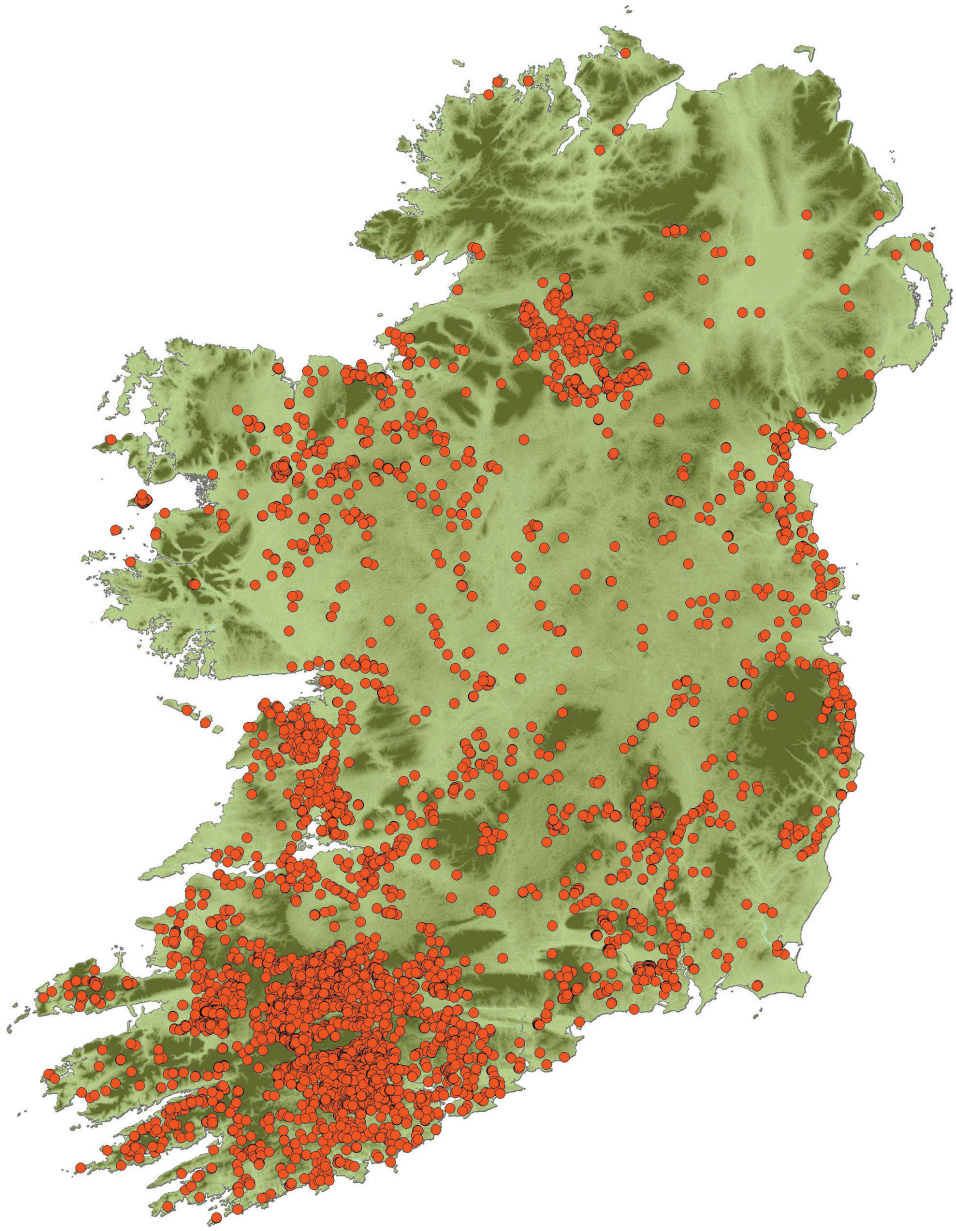

Figure 1.2. Distribution of recorded burnt mounds in Ireland. Source: www.archaeology.ie and www.doei.gov.uk.

an opportunity to review this aspect of their use, which was first alluded to by the historical sources and experimental work in the 1950s (O'Kelly 1954).

The social aspect of these sites will also be considered in this study. In Bronze Age Ireland the cooking and consumption of food was carried out using both direct and indirect methods. The latter involved the heating large amounts of water using hot stones. This represented a considerable social investment, requiring both organised labour and collection of raw materials. The laborious nature of the process suggests that cooking food in this manner may have been largely social, connected to special events and feasting. Their exclusive occurrence in specifically designated areas within the settled landscape suggests a clear separation, where particular places were selected for the application of water-boiling. This would also indicate that their use had a social function beyond the immediate occupants of a single settlement or house site.

(d) Settlement and cultural context

While burnt mounds cannot be described as residential sites, they are certainly an important element of local settlement landscapes in many parts of Ireland.

It was initially suggested that burnt mounds represented areas of transient settlement or temporary hunting camps (O'Kelly 1954), however this now appears to be untenable. The recent discovery of prehistoric settlements

Figure 1.3. Burnt mound at Mangerton, Co. Kerry (RMP KE084-044005). Source: National Monuments Service, Department of Culture, Heritage and the Gaeltacht.

and house-sites in proximity to burnt mounds on many road schemes in Ireland provides an opportunity to examine the wider settlement context of these sites. Like other monuments, burnt mounds should not be examined in isolation, but rather as part of a landscape structured by accumulated meanings. This project will undertake a study of burnt mounds as proxy indicators of prehistoric settlement. The application of GIS software will be useful in landscape visualisation of burnt mounds in relation to contemporaneous sites.

The study will also address the cultural context of the burnt mound phenomenon in prehistoric Ireland. This includes those developments that led to the origins of pyrolithic technology, from its initial use in the later fifth millennium BC to its widespread application during the Chalcolithic and Bronze Age. The eventual decline of the tradition during the early stages of the Iron Age will be considered, along with the mythologizing of this tradition in early historic period. The aim is to understand how the technology was viewed and practiced across the different cultural spectrums and the possible functional changes that may have occurred as a result.

1.3 SOURCES OF INFORMATION

To address these research questions, this study will focus on the rich excavation record now available for burnt mounds in Ireland. Recent infrastructure development has brought to light a large number of new burnt mounds, which have begun to influence the perception of the site type and presents an opportunity to review some key issues. The objective was to collate the archaeological information obtained from these investigations on different infrastructural schemes and interpret this evidence within a broader landscape context. This project brings together evidence from 1165 burnt stone deposits excavated in Ireland during the period 1950−2010, and includes a large number of unpublished sites. The aim is to study the archaeology of these sites in detail, to observe the development of the technology over time. Particular emphasis is placed on understanding the chronology and use history of burnt mounds, along with the social use of this technology and its wider cultural context.

The initial stage of research involved a comprehensive review of all published sources with details of excavated burnt mounds. The aim was to achieve a complete overview of the published sites, using the relevant grey literature. The archives of Transport Infrastructure Ireland and the National Monuments Section of the Department of Arts, Heritage and the Gaeltacht were accessed. The *Excavations Bulletin*, which provides an index of all licensed testing or excavations in Ireland up to 2009, provided another valuable source of information for the project. The latter source has its limitations in that only a minority of entries

contain radiocarbon or dendrochronological dates, as the reports were often submitted before post-excavation analysis was completed. Where possible, the original excavators and relevant archaeological consultancies were contacted in order to obtain detailed site information.

All burnt mounds excavated in Ireland up to 2010 are considered in the study, using data from published and unpublished sources to create an up-to-date catalogue of these sites. Some initial issues addressed in relation to the collection of data for analysis were the geographical parameters that would determine the inclusion of individual sites. While the majority of recent infrastructural developments were undertaken in the Republic of Ireland, it was decided to extend the study to include sites excavated in Northern Ireland. In addition to sites excavated on recent infrastructural development, older excavations were also incorporated within the study to make the database comprehensive.

The selection of sites for the study is based on the presence of charcoal-enriched soil and burnt stone, as well as pits used as receptacles for either water-boiling or dry roasting. However, these criteria in themselves create certain problems. Heat-affected stone consists of fractured, angular and discouloured rock resulting from the intense heating and sudden cooling. As such, it is important to recognise that not all deposits of heat-shattered stones may reflect ancient pyrolithic processes as they can form in other ways (see Chapter 4). Infrastructure archaeology has led to the discovery of different site types employing a similar technology, including those that seem to be short-term sites surviving as spreads of burnt stone and charcoal. Most are interpreted as 'destroyed' burnt mounds, truncated and removed by later agricultural processes. A number of these sites were of short duration, and as such did not form substantial mounds of burnt stone. These sites have not been given the significance they deserve. To maximise the potential of this study, all variations of pyrolithic technology were examined if the site information could be accessed. This included burnt stone spreads with no identifiable features, including sites that lay outside a particular road or pipeline corridor and could not be fully excavated, and those examples where components of the water-boiling or roasting process were identified. As a consequence, some sites were excluded from the study based on the limited excavation evidence, the absence of excavation records and uncertainty as to whether a true pyrolithic technology was carried out. A number of constraints were also created by rescue environment of most of these burnt mound investigations. Prior to the study, much of this new information remained unpublished due to nature of the large number of developments undertaken by commercial archaeology companies during the so called 'Celtic Tiger era' (1998−2007). Much of the relevant information is available in the excavation reports submitted to the licence authority of the National Monuments Section of the Department of Arts, Heritage and Gaeltacht. Access to this information varied with some excavators only providing permission to consult reports in the Department Offices in Dublin. Although there is a legal requirement that copies of excavation reports should be lodged with the licencing authority, this had not always been done and in many cases these were only preliminary stratigraphic reports. In the Republic of Ireland, access to reports less than three years old is not permitted without written permission from the site director. Such requests were not always met with full co-operation depending on the attitude of individual directors. As a result the full information from a small number of sites could not be included in the study.

Consultation with archaeological companies yielded more success than with individual excavators. This survey was conducted following background research, so that it was possible to approach consultancies for details with lists of their published sites that were relevant for the project. Those consultancies with no record of publication were also approached in order to capture sites that had not yet entered the public domain. It was not possible to establish contact with every commercial company even after several requests were made. The level of detail in these reports also varied considerably, with some consisting of basic stratigraphic information, while others still awaited specialist analysis, radiocarbon dating and final interpretation.

In the event where commercial companies or site directors could not be contacted in relation to burnt mounds excavated on road development projects, many final reports were kindly provided by Transport Infrastructure Ireland (TII). Their online database was also useful in this regard. This contains a basic account and classification of sites excavated by TII, with details of radiocarbon dates and other analyses.

While every effort was made to acquire information on excavated sites, a number had to be excluded where reports were not available or written. This still left 1165 sites with excavation details for analysis in this study. Despite the problems of accessing unpublished site information, and the variable standard of records, enough data was collated to gain a better understanding on the burnt mound phenomenon.

In analysing the data, the formation processes involved in the creation of the archaeological record were carefully considered. In relation to the context of artefacts and radiocarbon samples it is clearly important to assess the possibility of pre- and post-pyrolithic activity on the site. Exploring both cultural (c-transforms) and natural (n-transforms) in the formation of sites is essential to a more comprehensive understanding of the archaeological record (Schiffer 1987: 22). This is explored further in Chapter 5, following a tentative classification of these sites in Chapter 4. It is acknowledged that the available data does not always fit neatly into the parameters constructed. The value of classification, however flawed, is to illustrate the wide variety of situations in which burnt stone deposits

are found and allow distinctions to be drawn between the different types of site employing pyrolithic technology.

Theoretical framework

To understand the use and social significance of burnt mounds, several theoretical approaches are considered. At a most basic level archaeological theory today is generally grouped into two approaches, namely processual and post-processual archaeology. Processual archaeologists believe that cultural change happens in a predictable framework that can be understood and unlocked through the application of science (Trigger 1989). It seems that the functional and economic aspects of processual archaeology have been to the fore in research on burnt mounds in Ireland (Condit 1990; Cooney and Grogan 1994; Gosling 1994). Many of the studies published by Buckley (1990) and Barfield and Hodder (1991) have some theoretical basis (particularly processual approaches) but unfortunately there has been little integrated study of these sites in Britain and Ireland. As Ó Néill has observed, 'burnt mound research in Ireland has revolved around a series of analytical approaches, rather than as a focus of *de facto* explorations of archaeological theory' (2009: 21).

One approach to understanding how community, place and identity were connected to the use of burnt mounds is to consider their landscape context. Although archaeologists have always been interested in the broader environmental context of ancient settlements and monuments, the idea of 'landscape archaeology' as a theoretical approach for understanding the past is a relatively recent phenomenon. As observed by O'Brien, much of the recent research on prehistoric landscapes in Ireland has focused on so-called 'sacred landscapes', 'elite landscapes' and 'landscapes of power' with little research on the 'unexceptional landscapes of everyday living' (2009: 324). As it is these environments where burnt mounds typically occur, it is important to understand how people in the past related to the world in which they lived, and how they invested their surroundings with cultural meaning through various symbolic processes connected to their sense of time and place. Thomas has observed that 'people are knitted into a network of locales with which, through habitual and inconspicuous familiarity they will have formed a kind of communion' (2001: 173). These locales have the characteristic of being places where people lived their lives in what were inherently 'social landscapes' made up of different scales of relationships. Landscape may thus be viewed as '…a network of related places, which have gradually been revealed through peoples habitual activities and interactions, through the closeness and affinity that they have developed for some locations (*ibid.*, 172). Burnt mounds are good examples of such places: environmentally differentiated space where the setting and use of pyrolithic technology contributed to a strong sense of local place and identity. The use of hot stones for cooking was not just a technical process, but also a social one and it was much about the making and reproduction of social relations, individual and group identities, as about the production of food (see Chapter 6). It is through these social contexts that burnt mounds will be considered in the study.

It is probably incorrect, however, to view landscapes where burnt mounds occur as having a single meaning. There is an obvious physical relationship in the sense of the natural environment in which these burnt mound users lived. There is also an economic reality in respect of the resources these places contained for pyrolithic technology (water for boiling, stone for heating and fuel for the hearth). There are also the political aspects of landscapes, with many examples of so-called 'contested' space. For example, it has often been observed in relation to megalithic tombs that by building long-lasting monuments, human groups laid claim to certain resources. The use of specific spaces by individuals and groups who invested their labour over long periods would have contributed to a strong sense of 'ownership', underpinned by close family ties. The concept is also symbolic in the way that a burnt mound was experienced, perceived and imagined by prehistoric people. People in the past lived in landscapes imbued with many meanings and memories. The re-use of pyrolithic locations over many generations must have been a practice imbued with symbolic meaning where groups created their present by reference to a remembered past (sense of place and history of place).

These issues will be considered in this study by examining the significance of burnt mound clusters and the use histories of particular sites. This is particularly relevant to burnt mounds, connected as they may have been with specialised feasting activities. Such places with complex use histories must have been imbued with meaning and this can be demonstrated at some sites by the presence of deliberate deposits. The building of monuments is about memory and provide constant reminders of the past (Bradley 1993). The clustering of burnt mounds in areas of the landscape may have been part of a process attributing significance to particular places, influencing their interpretation by present and future generations. Burnt mounds had an enduring quality and their physical presence as individual sites or clusters was a constant reminder of a human past that can serve the needs of people in the present. Re-visiting a particular site involved reference to the previous use of that place. Conversely, some mounds may themselves be commemorated through the mounding of further waste-firing stone in the same area.

It is obvious that the continued use of places through time draws attention to the historically constituted connections that exist between members of a community. In this way the landscape is a constant reminder of the relationship between the living and the past generations (Thomas 2001: 175). As Richards (1999: 84) observed, 'the past itself becomes a symbolic resource, and an essential component of the ritual impact of place, a dimension of meaning which can be manipulated to legitimise new political or social ideologies'. In this way, the social relationships of

later users of burnt mounds gained part of their validity by reference to common mythical origins. This can be connected to what Barrett (1999: 260) referred to as the 'archaeology of inhabitation', an understanding of place according to certain traditions and conventions, to which people contribute through their own practices.

Settlement space is also invested with cultural meanings that influenced how it was ordered, used and valued (e.g. Hodder 1990; Richards 1990; Parker Pearson and Richards 1994). As outlined by Brück (2001), these perspectives challenge strictly functional interpretations of activity areas. Although this type of analysis is usually applied in a settlement context, the same principles can be adapted to the study of burnt mounds if one accepts their broad association with nearby habitation. Parker Pearson and Richard's study of spatial organisation highlights the importance of considering symbolic meanings when exploring architectural space, and also that different meanings apply in different cultural contexts. Because activity at burnt mounds generally focused around the use of a boiling pit, excavators have highlighted the possibilities that some well-preserved sites provide evidence of a formal organisation of space around a central trough (Toolis 2005). This may be evident from a number of recently excavated burnt mound sites in Ireland, where burnt stone was deliberately deposited away from the central working area or where it was deliberately defined and revetted as opposed to haphazardly dumped in the immediate vicinity. Also relevant is the location of hearths and other stake-built structures almost exclusively at the short end of the troughs (Figure 1.4).

Figure 1.4. Edward Fahy's excavated stone trough and hearth from Drombeg, Co. Cork. Source: Dan Breen, Cork Public Museum.

Of some relevance here is the social analysis of space, approaches that were first developed by Clarke and Fletcher in the late 1970s (Clarke 1977; Fletcher 1977). Caution, however, must be expressed when dealing with social organisation of space as burnt mounds were unenclosed and the partial nature of many site records could hinder such analysis. That said, it is important to explore the cosmology that governed people in the past (see Barrett 1994). The idea that there is more than a functionalist or economic reasoning behind spatial organisation is an approach that can certainly be applied in relation to burnt mounds.

Agency has also been useful in the current thesis as a means to describe the role of the individual in the formation of burnt mounds. 'Agency' refers to the capacity of the individual to act independently out of inclination or self-interest (Giddens 1984). The more complex notion of group agency has also been important and revolves less around the role of conscious choices in affecting the environment, and more around the functioning of traditions and habits held by a group. These traditions are made up of attitudes and decisions made regularly by individuals within the group. Of particular relevance here was the idea of habitus, the way in which an individual's instinctive sense of what might be achieved is structured into a pattern of behaviour and passed on through the generations (Bourdieu 1977; 1990). For instance, burnt mound material found adjacent to the trough was deposited continuously over many years of intermittent use, a process that represents meaningful and intentional human agency (Dobres 2000). One effect of concentrating the debris within a limited area was to increase the height of the mound, with the result that they became strong visible symbols within the landscape.

On the basis that location mattered to the people in the Bronze Age when carrying out pyrolithic technology, it can be suggested that the position of burnt mounds may reveal something of social structures. Place matters, in that a landscape can be seen to be assigned meaning through places, and can be argued to be made up by a series of places (Casey 2008: 44–49), that meant something to the people who live in relation to them. There is no such thing as a 'non-place' as observed by Thomas (2001: 173), as a space is created when meaning is assigned to a specific area or feature in the landscape. These broadly post-processual ideas argue that settlement space in a given landscape was invested with cultural meaning, which influenced how it was ordered, used and valued (e.g. Hodder 1990; Richards 1990; Parker Pearson and Richards 1994). This perspective challenges the strictly functional interpretations of activity areas such as burnt mounds. One way to avoid the continued dislocation of 'functional' activities from discussions of

landscape as a cultural construct is to recognize that human action is always both practical and symbolic. As observed by Brück and Goodman (2001) any practical action may also be symbolic, as it reproduces a set of cultural values and social relations that are embedded in cosmological schemes. These are some of the many considerations for the current study of burnt mounds in Ireland.

1.4 BOOK STRUCTURE

This book is divided into four major sections, with nine chapters and a supporting catalogue (accessed online). The first three chapters are intended to contextualise the study, by presenting the overall research context and introducing the reader to the burnt mound phenomenon in Ireland and other parts of north western Europe (Chapters 1−3). The second section outlines the nature of burnt mound excavations in recent years and presents a detailed analysis of the new excavated material, along with a review of recent radiocarbon evidence (Chapters 4−6). The next section is the final interpretive section of the work, which moves from the detailed analysis of burnt mound features to a broader understanding of chronology, use, and social significance of pyrolithic technology in Ireland (Chapters 7−9). Finally, the last section presents the catalogue of excavated burnt mound sites in Ireland from the period 1950−2010. This can be access online at https://cora.ucc.ie/handle/10468/1953 and represents the authors PhD catalogue. A shorter appendix detailing a list of excavated sites is presented at the end of this book.

The next chapter (2) examines the history of research from early antiquarian investigations to the first scientific excavations during the mid-twentieth century. The value of the early Irish literary sources is also considered, which describe the use of pyrolithic technology and the influence they had on later interpretations. An account of the excavation and sampling strategies employed on infrastructural projects and the many problems associated with the investigations of burnt mounds on these schemes is also discussed. Chapter 3 outlines the international distribution of the burnt mound phenomenon with particular emphasis on the British evidence. A broader discussion based on the use of this technology in other prehistoric cultures in western and northern Europe will also be examined.

Chapter 4 is the first of two chapters that examines the 'Celtic-Tiger' era of commercially archaeology in Ireland and the subsequent upsurge in burnt mound discoveries and excavations as a result. This outlines the new archaeological evidence from burnt mound excavations over the last two decades, including such features as troughs, hearths, pits and ancillary features. It will be argued that not all sites share the same morphological characteristics, with the evidence suggesting that other functions are possible. Chapter 5 describes the approaches to dating burnt mounds, both historically and using current applications. The overall chronology will be presented using recent dating evidence that will shed light both on the origins of the tradition and when the use of the technology is abandoned. An assessment of the material culture recovered from these sites also highlights the problems with using these artefacts as reliable dating evidence. The chronological evidence is discussed further in relation to cultural context in Chapter 8.

Chapter 6 is the first of three discussion chapters that examine the results of burnt mound excavations in Ireland (Chapters 6−9). This chapter considers the use and social significance of these sites in light of this evidence. Chapter 7 explores the landscape setting of these sites and their proposed relationship with nearby contemporary settlement. Chapter 8 continues with the theme of chronology and discuss the cultural context of the technology. The use of the technology will be discussed from its earliest beginnings in Neolithic Ireland to its widespread use during the Bronze Age. The abandonment of the open-air tradition of pyrolithic water-boiling will also be considered and it will be argued that the technology did not continue into the historic period. Chapter 9 will draw information from the previous chapters to discuss the conclusions that arise from this study, and to suggest directions for future research.

The main text is supported by a database and catalogue containing a record of some 1100 excavated burnt mound sites in Ireland. Appendix 2 is the principal database and includes a list of all known scientifically excavated sites in Ireland from 1950−2010. This data is presented in a table format giving each site its own unique catalogue number. Basic locational details are also provided, while the main excavated features (troughs, hearths, burnt mounds etc.) are presented along with the dating evidence if available.

A more comprehensive catalogue is available online through the authors PhD thesis. It is presented in this format due to the sheer volume of information collected and as such, could not be included here. It includes a summary of the excavation record providing information such as locational setting, cultural landscape, excavation information, site interpretation and any plates and figures. This is presented in Microsoft Word format in alphabetical order by county, from the earliest excavation to the most recent. The catalogue numbers presented in the main text refer to a unique numbering system given to each site and can be cross-referenced with the catalogue for further information.

Appendix 1 is a collection of tables that, because of their lenght, could not be inlcuded within the main text.