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The Adoption of Agriculture in Ireland: what are the key research challenges?

A Summary of Consensus Views of the Challenges Ahead

A Draft Report for the Purpose of Generating Feedback

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1. Introduction

This report outlines the first stage of results in a consensus building exercise examining research priorities for the adoption of agriculture (the Mesolithic – Neolithic transition) in the island of Ireland. The report is a first draft that seeks to obtain feedback; which should be sent to the author (see below for contact details). A further opportunity for feedback is provided in a public seminar, hosted at UCD on May 17th 2008. Feedback is welcomed until June 30th 2008 and following this date, a final version of the text will be prepared. The background to, aims and methods of the project are briefly outlined below, followed by analysis of the project data and recommendations for future research priorities.

It is important to stress that this document is NOT the final statement of the agenda, that further feedback, including prioritising the themes identified, is required. Even the forms of publication of this project remain open for discussion and suggestions of this nature are welcomed. It is worth acknowledging that the final challenges outlined are not what I expected when I began the project.

Finally, and as discussed below this project is an attempt to identify common themes amongst a broad sample of researchers, there is no intention that these discussions or the recommendations that arise from them should be seen as limiting or controlling. ***It cannot be stated too strongly that research focusing on the transition that is not discussed in this exercise is absolutely valid, and that it would be a complete misrepresentation of the rationale behind this project to use it to argue against any given piece of research because it was not discussed herein*.**

1.1. Background

The transition to agriculture is widely regarded as a major watershed in human history; with Barker's recent global review following a long tradition in stating that '(t)he transition from foraging to farming was the most profound revolution in human history' (Barker 2006, 414). The change from hunter-gatherer to farming modes of subsistence has been a major focus for archaeological research, both in areas where farming was demonstrably 'invented' by indigenous peoples and where the adoption of farming relied on the dispersal of new techniques through colonisation, acquisition of new ideas, or combinations thereof. Many models of the transition to agriculture are revealing of our understandings of the modern world: with farming often being associated with sedentism, the origins of urban life, population growth and specialism, or, more recently, seen to lie at the origins of organised religion (e.g. Cauvin 2000; Barker 2006; Renfrew 2007; Smail 2008). For some writers, the origin of agriculture is the origin of the civilised modern (western) world (cf. Gamble 2007).

The importance of the transition to agriculture is also reflected in the diversity of opinion about what may have caused these changes and the wide range of evidence used to examine these problems. It is beyond the scope of this report to review these in detail, but the preface to the recent volume *'The Neolithisation of Denmark: 150 years of debate'* (Fischer and Kristiansen 2002b) argues that:

> "… its (neolithisation) research history is also the history of the development and integration of natural science with archaeology. It represents the birth of ecological archaeology. But in a wider perspective it was part of the birth of modern times and a new perception of history and science, something of which the archaeologists, biologists and geologists involved were themselves well aware" (Fischer and Kristiansen 2002a, 1)

The study of the adoption of agriculture is a microcosm of the development of modern archaeology, and includes substantial contributions from, amongst others, field archaeology, archaeological science, palaeoenvironmental studies, palaeolinguistics, and both ancient and modern DNA, notwithstanding the significant development of relevant theory through

ethnoarchaeology and comparative anthropology (see also Barker 2006 for discussion of the diversity of evidence). This variety of competing evidence and hypotheses is a real strength, and the best archaeological interpretations will integrate this diverse data. However, the diversity can itself lead to difficulties, as Cooney (2007b, 543-545) highlights, discussing the 'parallel worlds' created by different analytical approaches based on diverse and limited data sources:

> "the cumulative effect is that approaches to the problem sometimes seem to run on parallel tracks, rather than informing and being informed by other strands of the discussion. This has resulted in a fragmentation of the discourse and the presentation of very different and partial views of the transition, even in the consideration of particular regions or dimensions of the evidence" (Cooney 2007b, 543-4).

The problem of these parallel worlds is perhaps most obviously seen in the literature by the sometimes difficult relationships between those using genetic evidence and those using more traditional archaeological approaches (for Irish examples, see Bradley and Hill 2000; Cooney 2000a; Hill et al. 2000; Nash 2006; for general discussion Pluciennik 2006), but the relationship between environmental archaeology and theoretical archaeology could also be considered in this light. Beyond the occasional flurry of public debate about the integration of different data lies a much broader problem of misunderstanding and, at times, very limited awareness of the relevance of unusual data sources.

However, the fragmentation of information relevant to the adoption of agriculture in Ireland is greatly exacerbated because of the dominance of development-led archaeology in Ireland and problems in the structure of the discipline of archaeology, which is described in a recent review as 'characterised by a number of systemic failures' (Anon 2006, 11). These failures have been extensively discussed recently, especially in terms of the difficulties in integrating the results of development led archaeological interventions in broader research contexts, given problems in the structure of reporting requirements, uneven reporting quality, difficulties with the tendering process, and general pressures on time and resource (Anon 2006; Cooney 2007a). Information and expertise transfer within archaeology in Ireland remains poor. In a small country, personal networks link some individuals, and information can filter through these lines of communication, but as highlighted by one interviewee for this project, the result can be a little like a game of Chinese Whispers. Access to information for those from outside of Ireland is very difficult. As argued below, although early prehistoric sites are unusual in a developer-funded context, the relationship between developer-led archaeology and the varied other strands of research into the transition is critical. This relationship is central to this report and its recommendations. In this sense of course, the transition to agriculture as a microcosm of archaeology means that it is a microcosm of archaeology's problems. It is beyond the scope of the project to resolve all, or even most, of these issues (for larger scale suggestions, see Anon 2006) but it is hoped that discussion of this relationship in the context of a specific research framework is of much broader interest, in Ireland and beyond.

This report does not offer a summary of the current state of knowledge of the events in the centuries surrounding 4000 BC. The transition in Ireland has been reviewed a number of times over the last decade, of which the most significant synthetic contributions from archaeology are mainly from Gabriel Cooney and Peter Woodman (e.g. Woodman et al. 1999; Cooney 2000b; Woodman 2000b; Cooney 2007b) with many more individuals reviewing particular data sets or themes (e.g. and not limited to, Monk 2000; Tresset 2003; Woodman and McCarthy 2003). Other key themes include Michael O'Connell and Karen Molloy's work on early neolithic farming, (O'Connell and Molloy 2001), and the research of Dan Bradley's genetics team at Trinity (Hill et al. 2000; McEvoy et al. 2004; Bollongino et al. 2005; Larson et al. 2007; Edwards and Bradley forthcoming). Given the range of work in varied subject areas, and occasionally spectacular archaeological discoveries, such as the early causewayed enclosure at Magheraboy, Co. Sligo (Danaher 2007), one might have thought that all was well in transition studies in Ireland. In fact, a comparison with the state of

knowledge in other areas of Europe is revealing. Here, the recent publication of a major international conference *'Going Over: the Mesolithic-Neolithic transition in North-West Europe'* (Whittle and Cummings 2007) provides a useful point of reference. A concluding paper by Whittle argues that "(b)ecause of the intensity and variety of both research and development-led investigations, we have now achieved a good working knowledge of the sequences of most regions within the area covered by this volume" (Whittle 2007, 617) highlighting areas where new information is still accumulating, and those with a pre-existing knowledge basis. Ireland must be classified as an area where information is only beginning to accumulate, and, given the difficulties noted above in terms of knowledge derived from developer-led archaeology, access to this information is deeply problematic, especially for a research community which transcends national boundaries. These problems limit the integration of Ireland into broader narratives, and therefore some of the major European research programmes. This is very unfortunate, as the adoption of agriculture in Ireland is internationally recognised as a very interesting archaeological problem. This is discussed in more detail below, but it is worth stressing here that many archaeologists from overseas interviewed as part of this project had no hesitation in providing a number of 'contributions' that understanding the transition in Ireland would make at a European level.

The adoption of agriculture is highlighted as a 'key research question' within the 'Landscapes and Settlement' theme of the Heritage Council's (2007)`*A Review of Research Needs in Irish Archaeology*` , with the following explicit questions:

> "What is the background to the introduction of agriculture? What was the character and impact of the prehistoric and historic agricultural economy, and how has this affected the form and organisation of the landscape?" (2007, 14)

It is worth noting that the adoption of agriculture could be argued to be central to *all* of the research themes identified in the Heritage Council report; namely *Cultural Identity, Territory and Boundaries; Resources, Technology and Craft; Exchange and Trade; Religion and Ritual; Environment and Climate Change; Landscapes and Settlement; Archaeology and Contemporary Society*. To take but one example, recent discussions would imply that the origins of agriculture are related to major developments in culture, attachment to place and, through urbanisation, the development of territoriality; thus the transition should be central to the *Cultural Identity* theme. The origins of agriculture in Ireland are a problem of critical importance to understandings of the story of Ireland.

And yet, it is sobering to record that for most archaeologists in Ireland the transition is a revolution that is hardly encountered. The dominant response from commercial sector archaeologists to this project was of interest but almost always the first comment in interview was a variation on a common theme – "we've never found anything of this period" or "we've only found one site, and a few stray finds". Exceptions, of course, exist, and some of the possible reasons lying behind the comparative 'invisibility' of early archaeology in the develop-led sphere are discussed below, but for the day to day life of the vast majority of archaeologists in Ireland, especially field archaeologists, the adoption of agriculture hardly features as a critical problem; here, and throughout this report, the extent of '*disconnectivity* … between development led excavations and research driven problems' (Anon 2006, 11; see also Cooney 2007a) is acute.

Alongside this, it is not at all clear that this period figures in the public awareness of the past. The last (and only!) book on the mesolithic of Ireland is a specialist academic text some 30 years old (Woodman 1978) and no single volume text focusing on the transition to agriculture exists. In comparison three introductory volumes to the Mesolithic of Scotland have been published in the last 14 years (Wickham-Jones 1994; Finlayson 1998; Warren 2005). Dominant images of the Irish past begin with the first farmers: the question of how they got there hardly features at all.

1.2. Aims, methods and the nature of the data

Given this context, the need for oversight of the range of work currently being undertaken, and identification of the most important areas for targeting future work, is acute. The need to provide contexts for a scattered research community to engage in this process, and get to know each other, is also very apparent. There are a number of ways of moving forward from the current situation; one is through the provision of reliable, updated, and publically accessible databases of key information (see below for discussion) – especially sites and dates. Projects creating these resources are currently being managed by Prof Peter Woodman and their results are eagerly anticipated. Alongside these data reviews, however, a more thematic assessment of the key issues *as they appear to those working in relevant areas* is valuable. The current project aims to provide this overview, and recognised consensus building techniques have been employed in order to provide this in a methodologically robust manner. Interviews have been conducted with a broad sample of researchers in the field, including all relevant disciplines. All interviews have involved a similar range of questions and have typically lasted 45 minutes. Following the interview, a 2 page summary report has been returned to the interviewee, asking for their confirmation that their views have been adequately represented. Only when a confirmed version of the report is obtained is the data used to examine consensus positions. This document represents the phase of synthesis generation, and will be circulated to all parties and publically available for comment. Further discussion is sought in a public seminar at UCD.

1.2.1. The questions

Questions were drawn from a limited range (Table 1). Not all questions were used in every instance, and in many cases, the questions provided convenient headings to structure reports on interviews that ranged much more widely. There is clearly overlap between some of these themes. Where possible, distinctions were maintained in the interviews between geographical areas of research, to facilitate comparisons. Some questions were left deliberately broad in order to explore the kinds of meanings people associated with key terms

In practice a very clear and rather predictable split in the interviews arose rapidly. Interviewees from the Universities and Museums were much more willing to discuss general themes in research as well as their own specific interests, whereas those from commercial units were, in many but not all cases, obviously uncomfortable in discussing overall developments and challenges. In part this reflects a problem whereby archaeologists in developer-funded contexts are not as familiar with the broad range of mesolithic-neolithic literature as university based researchers, unsurprisingly, as this period is often of little importance in development-led mitigation. One respondent from the commercial sector summarised a feeling that I think was widespread when he said, in good humour, that the questions felt like an exam (it should be noted that he would have received good marks for the answers). The pervasive split between sectors of archaeological practice may be important here in leading to a reticence in responding to questions that appear very academic in character. Furthermore, academics are trained to talk at length and to situate their work in broader contexts - many needed little prompting to do so. In practice, therefore, the range of questions addressed to colleagues in the commercial sector tended to focus more narrowly on the role of development-led archaeology in research into the transition.

The individual	What is your position?
	Describe your main research interests and study areas
The transition in your study area	What were the main processes involved in the transition in your study area?
	What have been the most important recent developments (analytical/methodological/theoretical etc) in studying the transition in your region?
	What are the key data sets for understanding the transition?
	What are the key strengths and weaknesses of research on the transition in your region?
	What are the key challenges for the next 20 years?
	What have been the most important developments elsewhere in Europe?
Ireland (if not covered by the above)	What are the key challenges for Ireland for the next 20 years?
	What, if any, is the contribution that the study of transition in Ireland makes to the study of the transition elsewhere?
Developer-funded archaeology and the transition	To what extent has developer-funded archaeology impacted on understandings of the transition in your study area?
	Has this impact been as substantial as one might expect? Why?
	What are the most significant transition sites your company have been involved with?
	How were these identified?
	Are there any especial challenges for your organisation in dealing with these sites in the field and/or in write up?
Other questions	What have been the most important recent developments (analytical/methodological/theoretical etc) in your field, in terms of their impact on this period?
	What are the key challenges for your field in terms of this period for next 20 years?
	What are the key recent publications in your field?
	How might inter-disciplinary communication and collaboration be facilitated?
	Any other comments?

Table 1: range of questions used in interviews

1.2.2. The data set

The initial phase of work involved contacting the a broad range of relevant researchers. This focused where possible on people with specific interests in the mesolithic-neolithic transition or other specific skills demonstrably relevant. There was no attempt to talk to *all* mesolithic or neolithic specialists. Some individuals have undoubtedly been overlooked, and I would like to apologise to anyone who feels they should have been interviewed: the feedback process itself allows for a very meaningful engagement with the consensus building.

The sample primarily focused on Ireland, but with a number of interviews from Britain and northwest Europe, with a very broad coverage in terms of geographical foci of research from the Far East through the Near East and covering much of Europe. The aim of talking to colleagues from overseas is twofold: firstly to obtain an outsiders perspective on the challenges and opportunities in Ireland, and secondly to ensure that any statements of future directions are developed in line with the leading European research themes. The sample

from Britain, and especially that from Europe is small and non-systematic, with a major bias to university based researchers. In order to control the sample size, in almost all instances, interviews in the University sector were restricted to people who had completed Doctorates rather than those currently engaged in research degrees[1]. Significant attempts were made to contact commercial archaeological units in Ireland and it is worth noting that one respondent from this sector explicitly commented that it was nice to be asked to be involved in a project of this kind.

In all instances contact was made by email: with an initial contact in September 2007, a second contact in November 2007 and a final attempt in January 2008. After three attempts no further contact was made. Over 100 people or organisations were contacted. A very small number felt that they did not have anything of relevance to contribute to the project, or felt that the project was not appropriate. The overwhelming majority of those contacted were interested and very helpful. Interviews have taken place in person where possible, but some have been conducted over the telephone or via email.

A total of 66 formal interviews were conducted from September 2007 to early April 2008; three interviewees did not return a confirmed draft of the report, and the final sample used in analysis is therefore 63. Although it is hard to see how a formally representative sample of opinion across such a diverse body of stakeholders could be constituted, the large number of interviews conducted, and the general diversity of viewpoints reflected, suggests that the sample is valid as a snapshot. A list of those interviewees who returned reports, and are therefore the basis for this document, is included as Appendix One.

Thirty one (49.2%) of the interviews were conducted with individuals based on the island of Ireland. A crude distinction was made between those who had worked substantially in Ireland (more than one research project), done some work in Ireland (one project) and those who hadn't. This crude division suggests that nearly half the respondents had done substantial work in Ireland of whichever kind (47.6%) and many have done some work here (20.6%).

The data set is skewed towards those who work in the universities. Nine interviews were conducted with commercial units (14.3%) compared to some 44 (69.8%) representatives of universities, with state bodies, museums and miscellaneous categories making up the remainder. This data set is clearly at some odds with the fact that the vast majority of archaeological work carried out in Ireland is carried out by commercial units and not universities. Restricting the data set to Ireland (31 interviews) gives a little more balance: eight (25.8%) commercial, 17 (54.8%) universities. However it is important that the 'University' data set is very diverse: within Ireland, for example, this includes people from Department or Schools of Geography, Genetics, Palaeoecology and Archaeology and with research interests as broad as this implies. Only nine of the sixteen University respondents are primarily archaeologists, a broad numerical equivalence with the commercial units. In any case, an overwhelming, if qualitative, sense from the interviews is that the experience of commercial units with regard to the transition is relatively limited. The reasons for this, and possible solutions, are of considerable interest, and are discussed below, but in general, the opinions of interviewees from this sector were broadly comparable. In contrast the diversity of research methodologies and approaches encompassed within the University, even if only narrowly defined archaeologists are considered, is substantial.

Interviewees included a number of colleagues from cognate disciplines, with palaeoenvironmental or climate specialists well represented (9). The contribution from genetics is represented by one individual, whilst palaeolinguistics are not directly

[1] Two exceptions were made. Killian Driscoll, who had completed a very substantial M Litt on the Stone Age of Western Ireland; and Hannah Cobb, who had just submitted a PhD on the Mesolithic-Neolithic transition in the North Irish Sea Basin. Both pieces of work were of clear direct relevance to the project.

represented, even if substantial discussion of this evidence did take place in two interviews. One unfortunate lacuna is the absence of input from specialists in river history or alluvial archaeology – here planned interviews never took place for varied reasons. The opinions of all of these specialists will be sought at the feedback stage.

It is important to note that comparisons between regions are affected by the sample composition in different areas; with interviews in Europe or Britain focusing more heavily on University based archaeologists or palaeoenvironmental specialists. Differences in the frequency of responses in different areas cannot therefore be taken as absolute, and must be understood in the context of this sample bias. That said, and as noted above, it is very hard to imagine what a representative sample of this body of researchers would be, given the diversity of interests involved. Further problems arise, for example in comparing the one interviewee from genetics with the dominance of archaeologists in the sample. Quantification in this sense is very difficult. The statistics presented must be understood in the context of these sample problems. They are best characterised as a snapshot of a diverse community, and any patterns identified, beyond the basic statements focused on here, should be considered to require further work to substantiate statistically – even if some of those patterns appear inherently to have logical, and interesting, explanations in the character of archaeological practice in different regions.

Although extensive, the data set is therefore constrained in a number of areas. The data gathered is from interviews, often fairly informal. It is qualitative, and variable: in some conversations themes arose at different points, in others, a more linear progress through the questions was made. In summarising these interviews, key words and bullet points offer a short hand of the kinds of issues that interviewees raised (see Appendix Two for an example interview report). Key responses were then entered into a relational database, and key words and summaries were then simplified even further within the database to facilitate some quantitative overview (Appendix Two). It is important to note that this process of reduction cannot do justice to the complexity of opinion represented by individuals. Detailed quantified analysis at this level of detail is not appropriate and the discussions below use broad indications of frequency set alongside discussion of key themes.

1.2.3. The structure of this report

In the following section, this report outlines the consensus statements of key priorities and directions. This includes extensive discussion of the relationship between development-led archaeology and these research goals. Finally, and in keeping with comments from respondents, a series of key research questions are presented, arising from the consensus building process.

2. Results

The wealth of data available allows for a range of interesting analyses. Many of these are beyond the immediate scope of this document, and we will focus on the challenges identified by the interviewees. However, it is important to briefly set this in context, and brief discussion is offered of the following questions:

- What were the key processes characterising the transition?
- What, if any, is the contribution that the study of transition in Ireland makes to the study of the transition elsewhere?
- What have been the key developments?

2.1. What were the key processes characterising in the transition?

Most interviewees were asked "What were the main processes involved in the transition in your study area?" and many responded in terms of broad historical definitions of the transition – the appearance of domesticates, or novel material culture. Many interviews (n=49) also featured the long standing question of how the transition was initiated. Five generic responses to this question were recorded in the database: *adoption*, *colonisation*, *combination*, *complex* and *unsure*. These are not mutually exclusive; complex and combination, for example, were often associated. Many people emphasised the problems inherent in considering the question of initiation, with many (27%) stressing that they were unsure, often citing the paucity of the data base. Nearly a fifth (18%) of respondents described the processes as complex, sometimes stressing that our interpretations had not engaged with this complexity. A third (31%) argued that a combination of adoption and colonisation had taken place; people who said this often also stressed complexity. Overall, adoption (12%) or colonisation (12%) were equally common.

	Ireland		British Isles		Europe & Other		Total
Adoption	2	13%	3	13%	1	10%	6
Colonisation	5	31%	1	4%		0%	6
Combination	2	13%	7	30%	6	60%	15
Complex	1	6%	6	26%	2	20%	9
Unsure	6	38%	6	26%	1	10%	13
	16		23		10		49

Table 2: broad descriptions of important processes at the Mesolithic-Neolithic transition, grouped by geographical origins

A clear distinction is apparent in Table 2 between people from different areas. People based in Ireland appear much more likely to stress colonisation as the dominant cause than in Britain or Europe. Indigenous adoption as the dominant process appears at low levels in all geographical areas of response with Irish researchers much less likely to stress that this process is complex or a combination. This distinction is not related to certainty – a fairly high proportion of Irish researchers as British were 'unsure'. In contrast, European colleagues appear to have a much smaller degree of doubt, and recognition of combinations of processes than colleagues in either Britain or Ireland; both possibly connected to a much greater data set in Europe[2]. Given the nature of the data such discussions can be crude indications only, and it is clear that subdivisions by geographic origin cut across the diversity of research interests linking Ireland, Britain and Europe. Nevertheless, if there is any

[2] Examining the data set in terms of the geographical foci of interviewee's research interests rather than their geographic origins shows a similar pattern.

consensus, it is we don't understand the processes by which agriculture entered Ireland. Taken as a whole, those working in Ireland appear less ready than colleagues in other areas to think of the transition as a complex process, and more likely to be considering colonisation as the dominant mechanism. This tendency, which should not be over exaggerated, begs the question of whether this reflects differences in Ireland's past or differences in the practice of archaeology in the present. These responses may also reflect that the transition has not been a significant problem in Irish archaeology in the way that it has elsewhere.

2.2. What contribution does the study of the transition in Ireland make?

Forty-one respondents were asked about the potential contribution that understanding the transition in Ireland would make to understanding the transition elsewhere. A total of 96 responses were recorded, covering 18 generic themes. A great many responses drew broadly on the themes of island archaeology, often not elaborating on the supposed benefits of such a practice and this generic response was not classified separately. Eight responses were cited by more than 10% of respondents (Table 3) and these are discussed in turn.

	N	% of 41
Ireland is different	**15**	**37%**
regions/network/contact	**15**	**37%**
peripheral location in Europe	**12**	**29%**
Ireland's ecology	**12**	**29%**
Sites, importance of	**11**	**27%**
Preservation	**6**	**15%**
story, has its own	**6**	**15%**
neolithic package	**5**	**12%**
profile, public and profession	**3**	**7%**
terminology/definition of periods/material	**2**	**5%**
Developer-funded archaeology	**2**	**5%**
research, context and character of	**1**	**2%**
proxy evidence	**1**	**2%**
Size	**1**	**2%**
mesolithic archaeology	**1**	**2%**
material culture studies	**1**	**2%**
specific interpretative themes	**1**	**2%**
DNA	**1**	**2%**
Total N. responses	**96**	
Total N. respondents	**41**	

Table 3: What is the contribution of Ireland? N shows the number of times this reply was used, the % shows the proportion use amongst the 41 people who were asked this question.

Over a third of respondents thought that the archaeological ***difference of Ireland from Britain and Europe*** was a significant contribution. In particular here, it is the supposedly 'insular' late mesolithic that is often discussed. Related responses include those specifically stressing the nature of ***Ireland's ecology***, and especially the absence of large mammals (n=12). In this context, McCormick argued that the absence of aurochsen made early neolithic cattle in Ireland especially significant, as they allow a strict biometrical definition of early neolithic domestic cattle to be developed without any questions about the wild/domesticated status of particular individuals. Thus, Ireland, as an island, can be seen to

help define aspects of the **Neolithic 'package'**; a further four respondents highlighted this contribution in more general ways.

Over a third of respondents saw an important contribution in understanding the nature of ***regions, networks and contacts*** in some ways. Dominant within these responses, were those interested in how Ireland could provide a valuable contribution in terms of understanding networks or contacts over large water bodies. Some saw this as a contribution to a significant global problem. Specific questions raised by this are returned to below, but a stress on understanding the mechanisms of movement of people and animals was common. In a different sense, Ireland's ***peripheral location*** at the edge of Europe was mentioned by 12 interviewees; either stressing that it was at the end of a long European process, and sometimes seeing this position as a useful way of challenging dominant diffusion frameworks, or that it was in some ways environmentally marginal. The emphasis on marginality was more common from researchers based in Ireland than elsewhere.

Eleven responses focused on significant contributions of ***particular sites.*** Ferriter's Cove (Woodman et al. 1999), and especially the cattle bone from this site, was the most common site mentioned, sometimes in conjunction with a broader Irish contribution to understanding early origins of agriculture and how they spread. The Céide fields (Caulfield 1981; Caulfield et al. 1998), Magheraboy (Danaher 2007), Derragh (Fredengren 2004; Fredengren 2007) and the 'boom' of Neolithic houses were also seen as important. Six respondents stressed the potential for ***high quality preservation*** in Ireland, of both archaeology and palaeoenvironmental records (and one respondent pointed out that the palaeoenvironmental signal of the transition in Ireland was exceptionally clear). This includes a specific focus on the potential of Ireland's ***wetland archaeology*** (returned to below).

Six people argued that any regional ***story was important in and of itself***, and that it was more important that the transition mattered to people in Ireland than whether it was significant to others in Europe. Two respondents explicitly argued that as a farming nation it was essential that the Irish people engaged with this problem.

These varied responses then suggest that the Mesolithic-Neolithic transition in Ireland is perceived to have an important contribution in a number of broad areas, some of which are related to long standing traditions of island archaeology. Above and beyond the idea that every area has a story to tell, Ireland is perceived as being different from Europe, in terms of both cultural traditions and ecology, and understanding this difference and how it related to the processes of Neolithisation is important. Ireland's island location is clearly significant, in terms of understanding how processes of social contact and cultural change take place over water bodies, as well as clarifying the nature of the new Neolithic materials. A peripheral location is sometimes seen as providing potentials for understanding the influence of marginal environments, and this may be allied with good preservation. Specific sites, arising from both developer and research led projects are demonstrably seen to be of wider significance, and as having raised important questions that require further examination (see below). These contributions are, of course, not exhaustive, but provide a broad framework for considering the framing of research priorities.

2.3. What have been the key developments in the study of the transition over the last 15-20 years?

A total of 57 interviewees were asked to identify key developments in the study of the transition over the last 15-20 years (broadly defined), including important changes at a European level. As may be expected responses ranged greatly in kind, even when crudely simplified to facilitate comparisons, with 205 generic responses offered: six responses were used by a quarter or more of the interviewees (Table 4).

answer_generic	N	% of respondents
dating	29	51%
isotopes	26	46%
Developer-funded Archaeology	17	30%
Environmental Archaeology	17	30%
DNA	15	26%
Dichotomies in interpretation	14	25%
theory, general developments	10	18%
Nature of analysis/models	10	18%
data, generate more	8	14%
methodologies	7	12%
material culture studies	7	12%
sites, importance of	7	12%
what developments?	6	11%
research, context and character of	6	11%
wetland/underwater archaeology	6	11%
mesolithic archaeology	6	11%
databases	4	7%
regions/network/contact	3	5%
specific interpretative themes	3	5%
landscape archaeology	2	4%
nature of early farming	2	4%
Total N of responses	205	
Total N of respondents	57	

Table 4: Key developments in the study of the transition to agriculture; all respondents

Detailed attention here focuses on the dominant responses – those given by more than a quarter of researchers – which are often related to some of the less frequent answers. Brief discussion of responses made by 10-25% of interviewees is also given. Some interesting variation between regions is apparent (Table 5), and this is discussed in turn. In assessing these differences it is important not to loose sight of the problems with sample comparison between regions, noted above.

BY GEOGRAPHICAL BASIS	Ireland	% of 25	UK	% of 24	Europe	% of 6	Other	% of 2	Total
data, generate more	1	4%	4	17%	1	17%	2	100%	8
databases			2	8%	2	33%			4
dating	12	48%	15	63%	1	17%	1	50%	29
Developer-funded Archaeology	8	32%	6	25%	3	50%			17
Dichotomies in interpretation	5	20%	8	33%			1	50%	14
DNA	7	28%	4	17%	3	50%	1	50%	15
Environmental Archaeology	8	32%	7	29%	1	17%	1	50%	17
isotopes	6	24%	15	63%	4	67%	1	50%	26
landscape archaeology	1	4%	1	4%					2
material culture studies	2	8%	2	8%	3	50%			7
mesolithic archaeology			5	21%	1	17%			6
methodologies	2	8%	4	17%	1	17%			7
Nature of analysis/models	2	8%	3	13%	4	67%	1	50%	10
nature of early farming			2	8%					2
regions/network/contact	1	4%	2	8%					3
research, context and character of	4	16%	2	8%					6
sites, importance of	5	20%	2	8%					7
specific interpretative themes			2	8%	1	17%			3
theory, general developments	4	16%	4	17%	2	33%			10
wetland/underwater archaeology			3	13%	3	50%			6
what developments?	5	20%	1	4%					6
Total N. of responses	73		94		30		8		205
Total N of respondents	25		24		6		2		57

Table 5: Key developments in the study of the transition to agriculture; all respondents

2.3.1. Dating

The most frequently cited development was dating. This covers a range of topics, from the near-routine use of AMS dating of single entity samples, through best practice in dating and understanding of taphonomy, through to research projects of varied kinds. Stress on increased resolution in palaeoenvironmental analyses or climatic models was also clearly related. Dating is also seen as a significant challenge.

The application of Bayesian statistics to archaeological sites of this period, as demonstrated by Bayliss, Whittle and colleagues (Bayliss et al. 2007; Whittle and Bayliss 2007), has clearly caught the imagination in Ireland and the UK. It is important to note that the Bayesian revolution is not universal: some respondents had not heard of the techniques, whilst others expressed concerns about the application of these models in areas without sites with good sequences. As noted above, the much lower levels of emphasis on dating from continental colleagues (TABLE 5) suggest that the implications of this work are not well understood here. In contrast, researchers in Britain and Ireland stressed the new levels of temporal resolution possible, highlighting that these opened up entirely new kinds of questions about historical processes. The application of strong dating policies in the commercial sector on a regional level in Southern England and especially Cornwall was cited by a number of interviewees, and some sense of the strengths resulting from that is apparent in recent reviews (Hey and Barclay 2007). The importance of dating many more of features identified

than is currently the practice on sites discovered by the commercial sector was highlighted, with Hermitage (Collins and Coyne 2003) often cited in this context as an example of challenges to our expectations. Projects focusing on establishing the date of older, archival material, were also stressed as a key development, including Marion Dowd's work on human remains from caves (Dowd submitted) or the Irish Quaternary Fauna Project (Woodman 1997).

Developments in radiocarbon dating itself have been important, and will continue to be. Continued reductions in sample size, and the dating of 'new' materials, such as cremated bone or ceramic residues are important. Very few respondents discussed dating techniques in strictly archaeological contexts other than radiocarbon. Palaeoenvironmental specialists often mentioned tephra but it seems clear that the potential use of a wider range of dating techniques in archaeology, such as OSL, is still not widely appreciated.

Archaeological dating in general remains rather coarse, and many palaeoenvironmental specialists highlighted the irony that our temporal control for the environment is significantly better than for the archaeology. In part, the use of continuous sequences for palaeoenvironmental work facilitates greater statistical modelling of age; but the increased use of records of much greater sensitivity (varves, ice records etc) is also significant.

2.3.2. Isotopes

Nearly half of all respondents stressed isotopic analyses of varied kinds as a key development, in terms of diet, migration or both. Researchers in Ireland are much less likely to have stressed this than colleagues from the UK or Europe; and this difference continues when we compare those who have done research in Ireland (35% of 37 people mentioned isotopes) to those who have not (65% of 20 mentioned isotopes). This may reflect the very low levels of application of isotopic analysis in Ireland (Woodman 2004), and the lack of publicity of those analyses that have taken place or it is a product of the greater inclusion of the commercial sector in the Irish data base.

Taken more generally, this high level of response undoubtedly reflects the significant impact of these analyses over the last decade (Richards and Hedges 1999; Schulting and Richards 2000), which have been used in conjunction with dating, and especially corrections to dates based on marine calibration curves, to refine our understanding of the timing, and nature of the transition itself; perhaps most clearly in analyses from Western Scotland (Richards and Mellars 1998; Schulting 1998; Schulting and Richards 2000). Attempts to use dietary analysis to examine territoriality, marriage patterns, and the links between regions, are also important (Schulting and Richards 2001; Schulting and Richards 2002; Schulting et al. 2008). The combination of dietary isotopes and dating is clearly recognised as significant: Malcolm Lillie, discussing the Ukraine, suggested that "*before their* (AMS and isotopes) *application we didn't have the resolution to talk about a transition"* and many respondents report a similarly transformative impact on transition studies. More recently, the use of isotopes, especially strontium, to examine migration has caught the imagination, partly with dramatic individual studies such as the Amesbury Archer, but also, in a specific transition context through remarkable work on the composition of early *linearbandkeramik* communities (Price et al. 2001; Bentley et al. 2003; Bentley 2007). Some caution about isotopes was also raised by a small but significant number of interviewees, and this is discussed as a challenge below.

2.3.3. Environmental archaeology

Seventeen people identified developments in environmental/palaeoenvironmental fields, including climate; notably the rise of high resolution analyses and the integration of environmental techniques and analyses into archaeological practice. The significance of high resolution models of climate and palaeoenvironment, with the potential for quantified models of change, was seen as important by specialists in these fields, but also by archaeologists

more generally, with the broad synchronicity of environmental change and the transition to agriculture in Ireland clearly of interest to some.

The increased integration of environmental evidence into archaeological discourse was also stressed. Amy Bogaarde highlighted the maturation of environmental techniques, allowing the discussion of the 'agency of farming' and the greater integration of data and theory. Specific advances were mentioned by a number of people, including the use of proxies, or the greater integration of ecological models into palaeoecology. Debates on the character of Holocene forest structure (Vera 2000) were particularly significant. Some respondents argued strongly that some aspects of environmental archaeology in Ireland lag behind practice in other countries (Monk 2007; Murphy and Whitehouse 2007), and that we are not always using the latest techniques to contribute to much wider debates. Further development of environmental archaeology in a general sense is a clear challenge for the transition in Ireland, and is discussed further below.

2.3.4. Developer-funded archaeology

Of all the 'developments' discussed, the impact of developer-funded archaeology is most certainly poorly reflected in any quantification, not least because it was explicitly identified as a topic for discussion in many of the interviews. Given that the overwhelming majority of archaeological work in Ireland is carried out in a commercial context, it certainly appears initially surprising that it should have been identified as less important than the use of isotopes, for example. However, as mentioned above, sites of this period are very rare in the commercial context, and this may provide a simple reason for people not to have mentioned it as a key development in our understanding of the transition. Developer-funded archaeology may also be embedded in broader recognitions of transformations in the nature of archaeology over the last 20 years; especially in terms of the number of archaeologists in all sectors and the quantities of information available.

That said, nearly a third of all interviewees explicitly stated that it was a key development; with adjectives such as 'explosion', 'boom' and 'wealth' frequently used to describe the Irish situation. Many interviewees, however, expressed caveats of varied kinds: that the data, for example, was fantastic, but problems in dissemination existed; or that field standards were excellent, but may not be very sensitive to sites of the transitional period. These problems are addressed in much more detail below.

Colleagues in Belgium and Holland stressed the transformative impact of development-led work in their regions in recent years, notably in the importance of major wetland excavations of sites of this period, on a scale that could not have been financed in a research context; half of European colleagues stressed the impact of wetland excavations. It is little exaggeration to argue that the excavations and high level analysis conducted in advance of construction of a new dock at Doel, Deurganckdock, Antwerp, have suddenly placed Belgian research into this period onto the European stage (Crombé et al. 2002; Crombé and Vanmontfort 2007). Dutch wetland research in a developer-funded context is associated with rapid and standard setting publication - for example, Schipluiden (Louwe Kooijmans and Jongste 2006) or Hardinxveld (Louwe Kooijmans 2001b; Louwe Kooijmans 2001a) - has had a major impact on understandings of the transition at a European level.

2.3.5. DNA

Over a quarter of respondents identified DNA work as a key development, and the technique is highlighted as a one of the key recent developments in recent reviews of the transition globally by Denham, and in a specific NW European context by Whittle (Denham 2007, 13-5; Whittle 2007). Judging from the interviews, there remains considerable scepticism in the archaeological community about use of analyses of modern human DNA distributions to model the mesolithic-neolithic transition (e.g. Chikhi et al. 2002; Bentley et al. 2003; Richards 2003). Critiques focused on the scale and generalisation of explanation, the historical depth of identified phenomena, and levels of specificity in interpretation and

analysis. The use of aDNA is seen as much more interesting (Haak et al. 2005; Ammerman et al. 2006; Burger et al. 2006). Many respondents also stressed the importance of work on animal migration and/or domestication, and in particular the contribution of the Trinity College Dublin research team, led by Dan Bradley (Bollongino et al. 2005; Larson et al. 2007; Edwards and Bradley forthcoming). DNA is less likely to have been mentioned by British colleagues than Irish or European. This may be related to some debate in popular Irish archaeological publications about the use of DNA as well as the wider application of such analyses in the context of 'Celtic' identities (Bradley and Hill 2000; Cooney 2000a; Hill et al. 2000; Woodman 2000a; McEvoy et al. 2004; Nash 2006). The complexity of DNA analysis, especially in its statistical presentation, was noted as a barrier to communication between the fields. Without wishing to revisit old debates about the relationships between genetics and archaeology, it is clear that considerable issues of scale and analytical practice continue to provide potential for disagreement.

2.3.6. Dichotomies in interpretation

A quarter of all respondents identified the development of 'dichotomies' as over the last 15-20 years. The exact nature of these dichotomies varied with people stressing naïve oppositions of hunter-gatherer and farmer; the terms mesolithic and neolithic providing false comparisons; economy and culture being separated in our analyses; and humanistic and scientific understandings not being drawn together. The dominance of transition studies by Neolithic specialists was noted by one respondent, and the old problem of the Mesolithic and Neolithic being dominated by different models of humanity was also stressed. Opinions on polarisation varied, with some noting that it led to ferocious debate, others proposing that it had led to a loss of potential synergy. One person characterised the transition as suffering from 'indoctrination and inflexible disciplinary approaches'. In general the existence of dichotomies was seen as a problem, and 15% of people identified resolving dichotomies as a key challenge.

No European interviewees identified this as a development. This striking distinction is probably related to the theory dominated character of debate on the transition in Britain and, to a lesser extent, Ireland. In 2000 Woodman characterised the state of research in rather bleak terms: "In the case of Britain and Ireland changes from a hunter-gatherer to a farming lifestyle have been written about with a prolific frequency. Any objective assessment of the problems must emphasize the fact that opinions are much more easily discovered than information based on the observation of actual archaeological data" (Woodman 2000b, 219). More recently, Gronenborn argues that:

> "Contrary to the often generalised Anglo-American approaches, particularistic traditions, based methodologically and theoretically on culture history and environmental archaeology, have continued, notably in the German speaking countries, but also in France. These have been substantiated by an ever increasing body of meticulously collected detailed data." (Gronenborn 2007, 74)

It is a sad reflection of how much genuine progress has been made in understanding the transition in Britain and Ireland that the existence of dichotomies should form such a strong theme in responses.

2.3.7. Other themes

Ten interviewees stressed general changes in our ***analytical models***. Key emphases here included a stress on the active role of hunter-gatherers in these processes, of building models with a human scale from the base up, starting with local developments and placing these in broader contexts, and understanding the transition as a time characterised by changes rather than a singular event of change. Suspicion of large scale pan-European narratives was noted.

General ***developments in theory*** over the last 15 - 20 years were also highlighted by ten of interviewees. As might be expected, opinions of exactly which theories had changed, and to what benefit, varied, but these responses might generally be glossed as describing the influence of interpretative archaeologies. The specific application of these to the mesolithic was classified separately.

Interviewees also recognised the contribution of ***new data*** (not specifically that from development-led archaeology but sometimes encompassing this). ***Material culture studies*** were discussed by seven people, mainly pointing to advances with the application of new techniques, particularly in the field of ceramic studies. This response was rare in Ireland, and some concern about a decline in artefacts studies in Ireland and Britain was noted. Developments in ***methodologies***, mainly in terms of fieldwork standards, were noted. Seven people noted specific ***sites*** as having made a key contribution; these were mainly people from Ireland. Changes in our understandings of the ***mesolithic***, specifically, were noted by six people, mainly focusing on shifting interpretative frameworks, but also noting the contribution of fieldwork and data generation. No-one in Ireland mentioned this.

A total of six respondents argued there had been ***little or no development over this time*** period. Specific comments in this context included that the only book on the mesolithic was 30 years old, or that new theories had emerged, but were not adequately supported by the data. This answer was disproportionately common in the island of Ireland (5 of the 6 responses) and especially common from Northern Ireland: three of the six who argued this were based in the north, even if their research interests were much more substantial than this region - and one of the individuals based in Ireland who said this has very strong links with the North. Even more strikingly, 50% of all people interviewed in Northern Ireland responded in this way, as opposed to 8% in Ireland and 16% in Britain. Again, here the sense appears to be that the transition does not appear to be a live issue in Irish archaeology.

2.4. Key challenges

A total of 61 interviewees defined challenges for the next 15-20 years of research, either for Ireland, in general, or both. The responses to these questions varied very widely, as one might anticipate. Discussion here focuses on the Challenges for Ireland, with the general challenges as a background. In brief, the 193 responses from 47 interviewees regarding Ireland are comparable to the 134 from 29 focusing on general themes, with most variation reflecting the differences in the composition of the interviewee sample or in the nature of the questions, with challenges in theory more often cited as a general response (Table 6). Notwithstanding this, it is enormously telling that of the five most frequently cited challenges for Ireland, all cited by over 25% of interviewees asked this question, three are directly related to developer-led archaeology. In contrast none of the top five 'general challenges' touch on this relationship. Although this is biased by the sample composition and interview methodology, this also reflects the reality of modern archaeology in Ireland. Discussion here focuses on the generic problems identified, before specific recommendations are made for particular questions in the following sections.

2.4.1. Methodologies

The most frequently mentioned challenge for Ireland was 'methodologies', cited in 45% of responses to this question. This broad heading encompasses a range of concerns, from keeping on top of specific developments in archaeobotany or geophysics, to more generic stress on using the latest methods and maintaining and developing methodologies at all levels. Specific challenges in ***material culture*** are discussed separately below, but it is clear that the call for further work on lithics and ceramics includes substantial methodological developments. It is interesting that only two interviewees mentioned phytoliths and starch in

particular as a key challenge, and that the only one person had identified this as a recent key development. In a global context Denham argues that:

		IRELAND		GENERAL
answer_generic	N		N	
Methodologies	*21*	*45%*	*8*	*28%*
Dating	*15*	*32%*	*13*	*45%*
communication, developer-led and academic	*14*	*30%*	*4*	*14%*
site location/distribution maps	*14*	*30%*	*4*	*14%*
Fieldwork: more	*12*	*26%*	*11*	*38%*
Synthesis of extant data	11	23%	5	17%
regions/network/contact	10	21%	7	24%
profile, public and profession	*9*	*19%*	*2*	*7%*
mesolithic archaeology	8	17%	4	14%
research, context and character of	8	17%	6	21%
Nature of analysis/models	*7*	*15%*	*9*	*31%*
terminology/definition of periods/material	7	15%	3	10%
Environmental Archaeology	*6*	*13%*	*8*	*28%*
material culture studies	*6*	*13%*	*9*	*31%*
Databases	6	13%	1	3%
landscape change	5	11%		
wetland/underwater archaeology	5	11%	4	14%
data, generate more	5	11%	6	21%
DNA	4	9%	2	7%
landscape archaeology	4	9%	2	7%
Isotopes	3	6%	3	10%
nature of early farming	3	6%	2	7%
Definition of questions	2	4%	3	10%
Training	2	4%	2	7%
proxy evidence	2	4%	1	3%
Dichotomies in interpretation	*1*	*2%*	*8*	*28%*
Ireland's ecology	1	2%		
specific interpretative themes	1	2%	2	7%
theory, general developments	*1*	*2%*	*5*	*17%*
Linguistics			1	3%
Total N of responses	193		134	
Total N or respondents	47		29	

Table 6: challenges, specific to Ireland and general. Percentages as proportion of respondents, Bold Italic fields highlight differences of >10% between General and Ireland responses.

> "...microfossil and molecular techniques have revolutionised research into early agriculture over the last decade. As these techniques are developed and applied further ... the types of information generated and the types of questions that researchers can ask will expand. Archaeologists investigating early agriculture will need to embrace these new technologies and associated specialists as a matter of course; these methods should become incorporated as 'best and standard practice'." (Denham 2007, 15).

It appears, that notwithstanding some recent work, Ireland is significantly behind global and European (Kubiak-Martens 1999; Perry 1999; Kubiak-Martens 2002) trends here. Given the preservation potential in Ireland, and the possible use of starchy foods (Mitchell 1972; Hardy

2007; Mears and Hillman 2007) as a key component of the diet, the expansion of microfossil techniques must be seen as a key challenge. It is also of interest to note recent calls for understanding the role of insects in hunter-gatherer diets (Morris 2008).

Nine interviewees explicitly mentioned the challenge of assessing and developing methodologies for early archaeology in developer-funded contexts, and many more people in Ireland and elsewhere discussed this in terms of the relationship between developer-funded archaeology and research into this period. Numerically, this topic is certainly underrepresented, but formed one of the dominant themes of discussion, sometimes with requests for anonymity indicating an atmosphere of some scepticism. Importantly, concerns about the relationship between developer-led and wider research-based archaeology in terms of methodology, were encountered across the geographical areas covered; these are not a specifically Irish phenomena. Discussion about the need for communication between the sectors, and about training and the integration of specialisms are discussed specifically below. Some of the problems raised lie beyond the immediate scope of this report, such as the oft-stated concern that competitive tendering does not facilitate embedding research designs (see also Anon 2006, 30), or the comparison between having period specialists target a site rather than commercial directors, who may normally have more field experience than research directors, but may not be a specialist in the particular period they are dealing with. The frequently asked question of why commercial archaeology finds so little in the way of early archaeology is arguably the most important issue facing research into this period in Ireland. Discussion here examines methodology, but related concerns about site location, landscape distribution and landscape change are all examined below as they are also often cited as a potential reason for the infrequency with which sites of this period are discovered.

A number of interviewees stressed the technical expertise of field archaeologists in the commercial sector, confirming the recent statement that ‘many development-led excavations are carried out in a professionally exemplary manner’ (Anon 2006, 35). However interviewees from all sectors of archaeology raised questions about whether there might be a problem with the recognition of early archaeological features; often with the expectation that these features would be very ephemeral or dominated by lithics. It is important to note a broader context here, with increasing recognition of ‘different views within the profession on appropriate methodologies and approaches to development-led mitigation’ and ‘a lack of communication and trust between different sectors’ (Cooney 2007a, 4). In the strict limits of interviews for this project several concerns appeared to be related to methodologies, and I here report summaries of extensive discussions:

- mechanical top soil stripping in advance of excavation systematically destroys an important part of the archaeological record: the information potentially gained from the distribution of artefacts in the topsoil. This information is not without its own problems but can provide invaluable information about the landscape distribution of prehistoric activity. Such losses make it much harder to work out all of the dates of and character of activity on site as well as understanding its place in broader landscapes.
- stray finds are not treated as significant evidence. Thus a mesolithic flake in a secondary context may receive little attention and may not be reach the public domain.
- extant methodologies are extremely efficient at identifying large structural features, but may not work as well for ephemeral archaeology. In particular, the distinction between trial trenching and monitoring of stripped areas was noted as a key difference here.
- that ephemeral archaeological may not attract sufficient attention from the public, or the developer, as more substantial, and immediately recognisable, features.
- that there is a lack of familiarity with this period, and the materials characteristic of it. This in turn may lead to problems with recognising the importance of features, and is certainly associated with general concern with the recovery and understanding of lithics in the field, from recognition of non-flint materials, through to sampling strategies for engaging with a lithic scatter in order to maximise information.

None of this should be seen as a direct criticism of those involved in the commercial sector,. As noted above, many interviewees stressed the technical abilities and professional standards of archaeologists in this sector. However, these discussions highlight potential

structural problems with the forms of mitigation practised in the field. This must be seen to be related to the absolute dominance of the structural over the artefactual in this context. Thus, for example, Conneller and Ellis (Conneller and Ellis 2007, 222) argue that in Southern Britain Upper Palaeolithic open air sites, dominated by lithic evidence and with little or no structural materials, are only found 'co-incidentally' with material of other periods in a commercial context – where the monumental or structural attracts the attention . They stress that the

> "…better definition of such sites and the development of suitable research and mitigation strategies that will permit detailed examination but also afford protection to a very important but already comparatively small, and ever diminishing, part of the archaeological record. " (ibid)

Open air Upper Palaeolithic sites are not a concern in Ireland, although perhaps they should be, but similar concerns could be extended to lithic rich and ephemeral sites in general.

These specific problems of development-led work are associated with a general lack of work on surface collections in Ireland, especially in comparison with Britain. The author is unaware, and stands to be corrected, of substantial examples of field-walking projects managed by commercial units in Ireland; compare, for example, the large-scale field-walking carried out by the Cambridge Archaeological Unit as part of the Fenland's Management Project, Eastern England. (Edmonds et al. 1999) Several projects have specifically focused on the transition through the mechanism of field-walking (Zvelebil et al. 1987; Zvelebil et al. 1992; Zvelebil et al. 1996; Kimball 2000) whilst other projects have used field-walking to examine the histories of particular regions (Brady 2002) or as ways of identifying early sites (Anderson 1993), but in general, and especially in the development-led context, the archaeology of surface scatters in Ireland is systematically ignored. Conor Brady's use of geophysics and soil chemistry in order to gain further information about scatters in the Boyne Valley is very unusual in Ireland, but relatively common elsewhere. Likewise, one could look to Sweden for examples of surface survey techniques in heavy forests, techniques which are closely related to those successfully utilised by Stefan Bergh in forestry plantations at Knocknarae, Co. Sligo. Recent work on extant museum collections has taken place, with Woodman et al's Keiller Knowles volume demonstrating clearly the potentials and the problems of this data set (Woodman et al. 2006) for analysis at the landscape level, but such programmes are unusual and have barely scratched the surface of the material within museum collections. See also below for a discussion of the problems of lithic analysis in Ireland.

The challenges identified by people here are significant, and the first difficulty lies in moving discussion of the potential significance of the methodologies used in the development-led sector beyond the rather anecdotal basis of current discussions. Related challenges were addressed by many people in the fields of training and profile raising in this field, with explicit discussion of the need to 'refresh peoples' memories' of this early material, Many individuals from commercial companies also stressed the need for predictive models of site location (see below) to facilitate them in dealing with this material. Given the overwhelming dominance of commercial archaeology in archaeology in Ireland today, and for the foreseeable future, providing a formal assessment of the suitability of the dominant methodologies used in this sector for the discovery of early archaeology is one of the most pressing of all research priorities for the period.

2.4.2. Dating

Fifteen people specifically identified dating as a challenge in Ireland, and thirteen saw it as a general challenge. As noted above, the range of dating used in Ireland remains limited, and most of the following focuses on C14. Aside from palaeoenvironmental specialists, little mention was made of alternative approaches, despite recent discussions of, amongst others, the relationships between archaeology and dendrochronology or tephra (Brown and Baillie 2007; Pilcher 2007).

Detailed responses ranged in kind, from recommendations of expansion of programmes of AMS dating of cereal grains (e.g. Brown 2007) through to the establishment of protocols for dating. A key theme in discussion was that following from the successful application of Bayesian models for this period, new kinds of chronology were now essential for answering many of the more detailed questions that were developing. Furthermore, dates with these kinds of resolutions will force us to stop using our binary classifications of Mesolithic or Neolithic, and should certainly caution against using 4000 BC as a cut off in this sense. An important theme, especially from people with a palaeoenvironmental background, was the need for archaeologists to greatly refine their chronologies in order to keep up with general trends in Quaternary science to model dates with increasing rigour. Given the apparent synchronicity of climate change and the adoption of agriculture in Ireland, refining our archaeological chronologies is essential to facilitate the assessment of possible causal factors.

The use of AMS within most sectors seems widespread, and in general, few specific concerns were raised about the standards of materials sent for dating. Much more common was a concern that too few dates were being submitted from sites – with a single date used to stand for a cluster of features, or the possibility of some features being left undated. Specific comments included worry that artefacts were too often used to date sites, rather than attempting to provide dates for the artefacts: if true, this is especially concerning given the paucity of our understanding of artefact typo-chronology in Ireland. Given that much of the archaeology of this transitional period might be expected to be ephemeral and to be fairly indistinctive, it remains very possible that sites of this period are currently undated within the archives. Assessment of this possibility is important. The use of small numbers of dates to stand for sites is not best practice, and cannot allow the development of Bayesian analyses of stratigraphy. Given that Bayesian analysis is not standard analytical practice in Ireland the introduction and sustaining of this approach is a priority. Creating a culture of multiple dating of features is also essential. Costs are clearly a significant factor here. Comparisons with Southern England, where robust recommendations from regional archaeologists have had significant influence in determining dating strategies in the development-led sector, are important here.

Specific programmes of redating archival material were mentioned: targeting undated cremation pits or archives of cremated bone is clearly related to the surprise at the age of the Hermitage cremation pits (Collins and Coyne 2003), whilst other concerns include lithics, especially the origins of polished stone tools, ceramics, faunal assemblages etc. The crude character of our chronologies of material culture is notable and, given the increasing data set present in the commercial sector, programmes of rigorous analysis and dating are a key area for development.

Dates obtained in the pre AMS era are evidently a problematic resource, but they remain central to many of our chronologies. Far too many sites, of most periods in Ireland, are poorly dated. Cooney et al follow a recent review of radiocarbon dates from Neolithic Ireland with the following conclusion.

> "... the agenda for the next decade of Neolithic research in Ireland must include: further dating of the enclosure and diagnostic Neolithic material culture at Magheraboy; the investigation of other possible enclosures; extensive dating of occupation and activity contexts other than houses; further dating of short-life samples from houses themselves; incorporation of environmental sequences into chronological models; further dating of short-life samples relating to the construction and primary use of monuments; and further investigation of the exploitation of porcellanite and other axe sources. The list could go on: there is no shortage of things to do." (Cooney et al. forthcoming)

Further specifics are listed below.

2.4.3. Communication between sectors of the profession

Thirty percent of respondents stressed the need to enable better communication between all of the sectors of archaeological practice as a challenge for Ireland. In contrast, only 14% of colleagues saw this as a general challenge. This discrepancy likely reflects the inclusion of greater numbers of commercial archaeologists in the Irish sample. Communication between sectors was discussed in a number of contexts – linking the varied theoretical perspectives for example - but was dominated by the need to facilitate greater communication between the research and commercial sectors. Communication was often directly cited as a solution to one of two problems, as reported by interviewees: i) information flow from the results of commercial excavations remains slow and ii) people in the commercial sector are sometimes unaware of the key themes in the archaeology of a period they are not very invested in – thus academics are seen to have a role in providing overviews and advice.

There is a sense here in which 'communication' is being identified as a solution to structural problems which should have a structural solution, but in the short term, and in the context of this project, establishing better communications between sectors is a key aim. Many respondents discussed these problems, some being negative about the potential problems involved in this, others rather more positive. At times, certain stereotypes of the 'other' are clearly present [3]. However, people also stressed that Ireland was a convenient size in this regard; that the potential for personal links was much greater than in other European countries. Accepting this, the extent of fragmentation of archaeology as a profession is much greater than in other European countries.

2.4.4. Understanding site location/distribution

As noted above, almost all respondents from the commercial sector in Ireland stressed the infrequent discovery of material of mesolithic or mesolithic-neolithic age. As discussed above, many interviewees, from all sectors, drew attention to the possible impact on methods on the recovery of early material in a development-led context, but the most frequent response in the commercial sector was to assume that the absence of finds was related to the landscape location of development, as opposed to the landscape locations of mesolithic settlement (Woodman 2003). In particular, the dominant argument was that the majority of development had not impacted on coastal, immediately riverine or other lacustrine contexts, and therefore had not found any material. This model of settlement relies on a simplification of the extant data for mesolithic settlement in Ireland and whether it can be considered a satisfactory argument for the extent of absence of material requires assessment.

Fourteen responses focused on the need to understand site location and distribution as a key challenge for Irish archaeology, sometimes with a GIS aspect specified. This response was significantly more common as a challenge for Ireland than a general challenge, where only four people mentioned it. Although few respondents specified the chronological scope of this task, for most, a mesolithic focus was implied. From a commercial or legislative perspective, this was seen to have a potentially very significant role in terms of site management and preparation of effective mitigation strategies. From a research point of view, a small number stressed the need to use predictive techniques, based on detailed understanding of site location, to target high quality sites.

In some cases the need for understanding site location was explicitly linked to the need to understand landscape change, with some discussion focusing on the potential underestimation of this in the field. Specific requests for detailed maps, showing the coastline in particular, at different time periods, were made and argued to have a very useful role in advising in development contexts. Given the difficulties with the database for understanding Irish coastal change (Brooks and Edwards 2006) and the comparative

[3] Given the dominance of the 'other' within a range of anthropological discussions, and the recognition that our perceptions of the 'other' are often projections related to self-definition and power relationships, a detailed sociological study of these perceptions would be of great interest.

absence of meaningful data for considering riverine change in Ireland (Howard and Macklin 1999; Macklin 1999; Macklin and Lewin 2003; compare the discussions of Ireland and Britain presented in Brown et al. 2007) the challenges in producing maps that could function at this scale are substantial. More generally it is hard to avoid an impression that the scale, temporalities and characteristics of landscape change since the early Holocene are frequently underestimated. Further work in this area is important, and dialogue is also needed.

2.4.5. Fieldwork

A total of 13 people stressed the importance of fieldwork as a challenge for Ireland, and 12 stressed this as a general challenge. In the context of the 'explosion' of development-led data it is worth noting that more people stressed the need for new fieldwork as a challenge for Ireland than did the need for synthesis of extant material (although of course, many suggested both). General discussions of the need for more fieldwork focused on the importance of finding sites with good stratigraphic sequences, often stressing the chronology came from stratigraphy, not just radiocarbon dates, and/or high quality preservation as well as the requirement for these sites to be located in areas which contained high quality palaeoenvironmental proxies.

Many discussions explicitly focused on the need to find a good wetland site. In fact, slightly over 10% of all respondents stressed wetland, or underwater archaeology, as a key area for development. In part this possibly reflects the high impact of well preserved mesolithic fish traps (McQuade and O'Donnell 2007) but one especially interesting comment here was that an increasing number of developer-funded projects are taking place in wet environments, either as drainage schemes, or in reclamations. The continual pressure of peat extraction is also important in this respect. The desire for a well preserved, i.e. wetland site, is clearly related to the specific requests made for fieldwork to provide increased amounts of particular data sets: faunal assemblages being the dominant example, especially for the Neolithic (McCormick 2007, 82). In this regard it is important to note a dominant theme from the interviewees in Holland and Belgium; that wetland sites have greatly enriched understandings of the transition in these areas, but that dry land work continues, and that integrating the resolution of the two sources of data is a considerable challenge and is being tackled with new and innovatory approaches. These are important lessons for Ireland, especially given spatial variation in the extent of wetlands within the country, and imply that we should not focus exclusively on one zone. A small number of interviewees also stressed the problems with isolated well preserved sites dominating discussion - what might be called the Star Carr syndrome. Seven respondents stressed the need to facilitate targeted research excavations as a key theme for Ireland, often in the context of working through questions raised by rescue work. Three people highlighted the need to revisit old excavations, either by fieldwork or further analysis.

The future of mesolithic-neolithic studies in Ireland, then, is demonstrably perceived to require a substantial investment in fieldwork and data generation (five people stressed this as a theme). Given the stress on methodologies (above) this should be understood to involve the highest possible international standards and latest techniques; in this sense, fieldwork in Ireland can sometimes be seen to draw on particular traditions. Discussions as part of this project highlighted, amongst others, the limited use of nested scales of fieldwork, from surface survey, to test pitting and trial trenching through to selection of sites for further investigation. A related concern, stressed by a small number of people, was that the remains of this period were under threat – that we had a responsibility to get information whilst it still existed. Programmes of monitoring of wetlands are discussed below, but similar programmes must be extended to consideration of all archaeological sites of this period, especially those at threat from ploughing. To my knowledge little or no monitoring of this kind is carried out in Ireland.

In this regard, the particular challenges of fieldwork focusing on earliest prehistory should be noted, described by Mithen as 'this is not easy archaeology', understanding early prehistoric settlement involves very particular archaeological challenges, with an emphasis on long term commitments to landscapes understood in their full palaeoenvironmental context, cooperation with local people in terms of monitoring for surface materials, and expensive programmes of analysis. Such programmes, of course, require substantial, and long-term financial support.

2.4.6. Synthesis of extant data

Synthesis of extant data, but especially that from development-led archaeology, was an important challenge, appearing in nearly a quarter of all interviews about challenges for Ireland. Two interlinked themes were dominant in these discussions; firstly the need for synthesis of the work from the commercial sector (11 interviewees), and secondly the need for synthesis to allow strategic uses of further resources (seven interviewees). Of course, calls for synthesis of this material are not new (Anon 2006). Specific requests for synthesis of particular materials or themes were sometimes mentioned (see also dating above), but the general theme is that synthesis would be a 'good thing' and little more detail is given. This sense that the answers will lie in the archives of the commercial companies and that we simply have to look there is rather concerning, as the mass of data available means that any attempts at synthesis must be driven by very clearly defined, targeted questions. Problems with extant reports in terms of quality, and the deterioration of archival material (Anon 2006, 26) make this challenge both urgent and complex.

2.4.7. Regions, networks and contacts

Many interviewees identified further work on regions, networks and contacts as an important challenge for Ireland or more generally. This included seven people who were keen to see further work on understanding regionality within Ireland, two of whom were particularly concerned to see work examining the coastal/inland relationship. Eleven interviewees stressed, in varying ways, the importance of understanding Ireland's place in wider regional networks, specifically the Northwest Atlantic coast, over the mesolithic – neolithic transition. Some discussion focused on the need to model, in very specific ways, the nature of contact over this period – a more detailed understanding of the mechanisms by which people and animals, in particular, were moved. As might be anticipated, this research theme was overwhelmingly identified by university archaeologists.

2.4.8. Profile

A concern with raising the profile of this period was common, with nearly 20% of interviewees identifying this as a key challenge for Ireland, and two seeing it as a key challenge in general. Three responses focused on the need to maintain funding and positions in this field with the remainder stressing the need to specifically raise the profile of the Irish material: clearly both themes are linked and raising the profile should be understood as including the state, the public (Anon 2006, 55; Cooney 2007a, 3) and, vitally, increasing awareness of this period within the commercial sector. Discussions on these topics were extensive and varied, and aspects of them have already been reviewed. It is important to note that over half of the emphasis on raising the profile in Ireland came from the commercial sector, sometimes in conjunction with stressing the difficulty of making the public realise the excitement of subtle archaeology, sometimes with helping their staff engage with this period.

2.4.9. Mesolithic archaeology

Fourteen people stressed the need for further research into the Mesolithic. As noted above, developments in the Mesolithic were often cited by researchers from outside of Ireland, with emphasis placed on recent changes in the theoretical basis of our understanding of the Mesolithic in Britain and Ireland (e.g. Conneller and Warren 2006). In contrast, four of the five interviewees who stressed the need for increased understanding of the late mesolithic

as a general challenge saw the need for much more than simply theoretical developments: thus Richard Bradley *'we have a real problem with our later mesolithic, we don't know enough about it to know what it could have contributed* (to the neolithic)*, why it could have ended, or even when'*. More specifically as a challenge for future work in Ireland increased understanding of the late mesolithic, increased theory, and increased data were all raised by interviewees in equal proportions. It seems clear that there is a strong feeling that the mesolithic, and certainly the later mesolithic, remains a problem in our models.

2.4.10. Research, general themes in

Eighteen people identified general themes in research as key, either as a general research priority (eight) or specifically for Ireland (ten). These responses fall into two key categories – those stressing the need for multidisciplinary work (seven) and those emphasising the need for research to be truly international in scope. At their most extensive, these latter models stressed the need for large, multidisciplinary teams. The need for Irish archaeology to overcome its insularity was noted by one interviewee, and is best understood in this context.

2.4.11. Analysis/models

An important theme identified for development is the nature of our models of the transition. In particular here, a stress was placed by many of avoiding dichotomy by understanding the transition as a time period of multiple changes rather than a single characteristic event of change. Others, however, commented that given the apparent sharpness of the change in the centuries around *c*. 3800 cal BC, that this was an event. The disagreement is further evidence of the importance of chronological precision in defining our models as well as another key feature stressed in discussion; that we need to understand what it is we mean by change and what we mean by continuity. Other responses stressed the need to place the local in broader contexts, or to humanise our models, especially to understand hunter-gatherer perspectives on change.

2.4.12. Terminology/definitions

Ten people identified key research priorities in questions of definition and terminology. With a specifically Irish remit, this focused on characterising the earliest phases of the Neolithic, but with a general concern for periods and definitions at this time. Two people felt that there was a pressing need to define the possibility of early starts and spreads from this. The reference appears to be to the Ferriter's Cove cattle bone which, in some models, is seen as evidence of a 'wave' of contact (This model is developed by Alison Sheridan, and can be seen in a number of review papers e.g. Sheridan 2003c; Sheridan 2003a; Sheridan 2003b; Sheridan 2004). One interviewee stressed the need for caution, before every cattle bone became a wave of contact, but the importance of carrying out further work to define and characterise this potentially early material is clear, especially given the general changes that appear to be taking place in the last centuries of the fifth millennium BC.

Five interviewees, discussing both Ireland and Europe more generally, stressed the need for further work and definition of early human and agricultural signals as identified by palynology and other proxies. The existence of 'pre-elm decline' *cerealia* pollen, and its associated interpretative problems, is well understood. In interview Gabriel Cooney highlighted the ways in which palynology had moved from being a central part of interpretations 20 years ago, to now being somewhat sidelined – and the general dismissal of pre-elm decline pollen may be significant in this regard. It is important to note that the existence of early agriculture as identified through pollen and other palaeoenvironmental proxies is receiving increased attention again, with important work on the Isle of Man seemingly forming part of a slightly broader European picture with possible sites post dating 4600 cal BC (Innes et al. 2003b; Innes et al. 2003 -a). Looking even more broadly, contentious claims for very early agriculture in central Europe have been made (Behre 2007; Tinner et al. 2007). A reappraisal of this evidence in the light of modern multi proxy sources would be of considerable value. Increasing evidence in Europe is demonstrating the impact of hunter-gatherers on local landscapes, either through fire management, especially the burning of

reeds or creation of other clearings, or through other mechanisms (Hicks 1993; Innes and Blackford 2003; Bos et al. 2006; Hörnberg et al. 2006; Mighall et al. 2007; Kuneš et al. 2008), and expansion of this work in Ireland is of considerable significance, especially given the difficulty of field survey for archaeological materials in many areas.

2.4.13. Material Culture

Developments in the study of material culture were mentioned by 13% of respondents as a challenge for Ireland, but by 31% as a challenge more generally. This may reflect the long standing down playing of material culture in Irish archaeology, especially in the context of commercial archaeology's focus on the structural.

Most comments focused on one of two materials – lithics or ceramics. In both instances, key issues of definition of typo-chronology remain, and these are also encompassed by discussions of ***'definitions'***. More generally, increased application of new methodologies was also stressed (see also above – ***methodologies***). Further specific comments included the importance of work on non-flint raw materials. Beyond this, however, a large number of people discussed the significant contribution of lithics, especially in terms of the use of surface collections and the evaluation of the data these represent. Several points made above are of particular interest here. Firstly, and as noted above, the stress in Belgium and Holland on setting wetland sites in context by continuing to focus on extracting the maximum of information from the scatters is an exemplar of best practice. Secondly, and as noted above, there has been limited use of surface survey in Irish Archaeology. Many people stressed that understanding scatters was the only way of trying to make sense of patterns of landscape inhabitation at this transitional period – even accepting that such analyses were by no means straightforward. More generally, the status of lithic studies in Ireland is limited, with comments from a small number of interviewees arguing that there was little or no wider appreciation of the range of information that might be gained from assemblages excavated and analysed to the highest standards. Given that the Irish Stone Axe Project (e.g. Cooney and Mandal 1998) is a project of high international standing this overarching impression of the status of stone tool analysis in Ireland is deeply concerning.

2.4.14. Databases

Six respondents saw the establishment of reliable national databases in Ireland as a key aim for the future, often with the assumption that these would be on line, publically accessed resources. Specific comments included emphases on how this would facilitate the incorporation of Irish material into international syntheses, which in turn would limit any insular interpretative tendencies. As noted above, respondents in Europe saw the establishment of databases as a key development of recent years, and not a challenge for the future. Similar arguments have already been made in the context of environmental archaeology (Murphy and Whitehouse 2007, xxi)

2.4.15. Environmental archaeology

Environmental or Palaeoenvironmental archaeology was stressed by twelve respondents, a little more often as a general challenge than a specific Irish one. Key themes in discussion focused on the integration of archaeology and palaeoenvironmental data, especially given the importance of new high resolution models of environments and climate. The lack of reliable climate models in Ireland was seen as a problem, with the need for development. Given the possible role of climate change in the adoption of agriculture in Ireland (Bonsall et al. 2001; Turney et al. 2006) the development of such models must be seen as an absolute priority. Further comments included the specific need for developments in palynology, Geoarchaeology, or the understanding of ancient ecologies.

2.4.16. Other topics

Several other topics were mentioned by small numbers of people, such as general developments in our understandings of monumentality. Over a quarter of those who discussed general challenges stressed the need to move beyond dichotomies (see above). Three areas deserve some mention however: DNA and Isotopes, which were frequently seen as a key development, but rarely as a challenge, and Palaeolinguistics.

DNA was mentioned as a challenge by six people, all of whom were from Universities and all of whom worked in Ireland. The almost complete absence of discussion of this data set in a developer-funded context in notable. Despite the low frequency of discussion of DNA as a challenge it is clear that this area presents an absolutely vital area of development. This is especially important because continued changes in the nature of DNA analysis are taking place, with Dan Bradley describing a situation where the *'scale for investigation of genome has ratcheted up several orders of magnitude'* with a massive increase in quantity and resolution of data resulting: the contribution from genetics will continue to develop, and continue to provide very important data. The challenges posed by genetics were described by respondents as including key theoretical developments in understanding the relationship between gene flow, language change and cultural transmission in the past, as well as the present. Archaeologists seemed generally concerned at how time depth was modelled in studies of modern genetic variation, and the use of aDNA in combination here was seen as a strength. A greater awareness and clarity about the specific kinds of questions that genetics can and cannot answer was also stressed, and this forms part of a broader concern that in order to work in a multidisciplinary fashion, one must understand the scales of analysis that are to be combined.

Isotopes, a dominant theme in discussion of developments, were only mentioned by six people as a challenge. Themes identified here reflect wider debates about dietary isotopic analysis (Milner et al. 2003 and responses), and stress the need for what Amy Bogaarde described as further *'scrutiny of inference'* in the application of these analyses. Ongoing work examining the possibility of localised fresh-water reservoir effects, and the difficulties of modelling the isotopic signals of diets with variable proportions of carbohydrate and protein are relevant, and a concern to ensure that direct dietary analysis paid due cognisance to faunal assemblages was stressed. More generally, some people were concerned that a technique did not run ahead of general developments in theory and modelling of the transition. These concerns do not invalidate isotopic analyses, but suggest that, in common with most archaeological techniques, a period of maturation and development follows initial excitement. It is not, at this stage, clear that awareness of this critique and reappraisal is widespread. Further developments are likely, with, for example the use of compound specific analyses (Evershed 2007). However, such developments themselves require critical appraisal and integration into wider analytical frameworks.

Finally, ***palaeolinguistics***, and the question of the relationship of Indo-European languages to the adoption of agriculture in Europe (Renfrew 1987; Renfrew 1988 and responses) was only identified as a challenge by a single respondent, who stressed the need to understand the relationship between culture/language/genetics and to consider the processes of language shift in more detail (Thomason and Kaufman 1988). More generally, this is stated as challenge for archaeologists to make more of an effort to engage with this material. Recent work includes controversial arguments for the existence of widespread pre-Indo-European languages that provide a substrate picked upon in Indo-European (Vennemann 1994). Those with a very specific archaeological tie in include claims that the languages of the British Isles were more closely related to Hamito-Semitic languages of North Africa and the Near East, ultimately with an Atlantic vector of transmission influenced heavily by hunter-gatherer/farmer contact into north and west Europe, than they were to Basque (for a useful short review see Baldi and Page 2006). Such discussions play little or no role in models of the transition in Ireland.

3. Challenges for Further Research

One of the points emphasised in a number of interviews was the role of research agendas. Some considered these to be useful, others were much more doubtful. Duncan Garrow offered a self-described 'mischievous' critique of role of research agendas, which he argued are academically driven as an attempt to establish or maintain control of archaeology in a changing world, frequently banal and of limited use in a developer-led context other than as a source for bibliographies. Critically, his comment that 'research agendas tell you what you need to find and need to think about, whereas developer-funded archaeology finds new kinds of sites', i.e. those that can't be predicted, reminds us of the transformative nature of archaeology as a subject. Accepting that no research agenda can predict the unknown, however, does not mean there is no value in assessing ways of progressing what we do know, or, perhaps more honestly, what we think we know. Such an exercise might provide a better context for unexpected discoveries.

Critique of how research agendas act as attempts to control research are an important reminder of the broader context and aims of this document: there is no intention that these discussions should be seen as limiting or controlling. As stated at the outset ***it cannot be stated too strongly that research that is not imagined in this exercise is absolutely valid, and that it would be a complete misrepresentation of the rationale behind this project to use it to argue against a given piece of research because it was not recommended here.*** The challenges outlined here arise from a review of the understanding in 2008: a discovery next year may completely change the situation. It is an inevitable outcome of any project of this kind that it is out of date as soon as it is completed.

There is little attempt here to define how challenges might be resolved, simply to identify areas that have been indicated by this consensus building exercise to be of interest to the research community. In this, a number of interviewees suggested that it was critical to specify questions that allowed of archaeological (or other) answers. Furthermore, such questions might present a resource that in 20 years time could be revisited, allowing someone to assess what progress had been made. What follows are attempts to provide questions of this kind. They are, inevitably, incomplete, and I look forward to receiving further comment and suggestion.

As noted above, the challenges are not the same as those that I would have identified six months ago; some are long standing problems, others reflect the nature of this project. There are also many questions that I would have wished to have seen included, but as they were not mentioned by interviewees, they have not been outlined here.

One crude mechanism for identifying priorities is being utilised: Appendix Three contains all 50 questions, with a tick sheet for rating the priority attached to this problem. As part of the feedback process I would be very grateful if people could take the time to complete this section. The results will offer some sense of areas that are perceived to be especially important. It is likely that feed back will lead to changes to the questions listed below.

The questions arising from the project are listed below, grouped according to broad themes – there is of course, considerable overlap between the themes. **All questions should be assumed to include the oft-stated emphasis on regional variation within Ireland and placing Ireland in its European context**.

3.1. Databases

1	Create and maintain, including all relevant updates, online databases of archaeological evidence dating 4500 – 3500 cal BC. This should contain: - Structural remains - Material culture - Ceramics, lithics (chipped, polished, coarse) - Etc
2	Create and maintain, including all relevant updates, online database of environmental evidence dating 4500 – 3500 cal BC. - palynological - archaeobotanical - tephras - dates - wood macros - etc

3.2. Dating (general)

3	Improve routine dating standards on archaeological sites of this period. This must include robust central guidelines on datings, including - movement to a situation where Bayesian modelling of chronologies is routine - multiple dates are obtained as a norm
4	What is the timing of the introduction of domesticates? To what extent does this vary across Ireland?

3.3. Dating (specific)

5	What is the timing of the introduction of ceramics? Establish high resolution robust typo-/techno- chronologies for ceramics. To what extent does this vary across Ireland
6	What are the changes in stone tool technology (chipped, coarse, ground and polished), from 4500 - 3500 cal BC in Ireland? Establish robust high resolution typo-/techno-chronologies for lithics. To what extent does this vary across Ireland?
7	At what time period do specific stone tool sources begin to be exploited?
8	Establish robust dating sequences for the origins of megalithic monuments
9	Continue to refine dating of early neolithic houses, and other settlement evidence, with especial emphasis on regional variation

3.4. DNA and Linguistics

10	Continue to develop the use of genetic evidence for the transition based on both humans and animals.
11	To provide greater time depth in genetic analysis through increased use of aDNA.
12	Assess the status of all large mammals, with especial reference to timing of introductions. This should include substantial collaborative work with contributions from DNA and archaeological data.

13	Develop models of the relationships between biological, cultural and linguistic transmission in Ireland in early prehistory. Such models must remain focused on people in the past.
14	To publish at least one synthetic paper every decade by archaeologists, geneticists and palaeolinguists critically comparing the available data.

3.5. Environment and Landscape Evolution

15	Create island wide models of landscape evolution for 4500 – 3500 cal BC with especial regard to sea level change and river process
16	Create regional analyses to develop detailed models of landscape evolution for key specific regions (e.g. Sligo, Carlingford). Following from this, use highest international standards, and predictive models where required, to test these environments for archaeological materials (see also below for development of methodologies)
17	Provide robust, quantified models of climate for the period 4500 – 3500 cal BC. Model the impacts of this climate change on the environment given the understandings of forest structure.
18	Understand the key factors involved in early Holocene forest structure in Ireland. With especial reference to - the 'grazing debate' - possible role of humans in management through, amongst others, coppicing and clearing - introduction of new large mammals
19	Identify and date key tephra and micro-tephras for this period

3.6. Fieldwork, new

20	Enable new multidisciplinary field research projects for this period. Such research should have three primary foci - Identify non-palimpsest sites to refine typo-chronology and site function - Target gaps in distribution maps - Provide genuine landscape scale understanding of variation of activity over the landscape.
21	Find well preserved site(s) spanning the transition. Ideally this/these should be waterlogged, with a full range of environmental proxies, and have a clear stratigraphic sequence allowing chronologies to be generated.
22	Further our understanding of site location for mesolithic and mesolithic-neolithic transition sites, with especial emphasis on - predictive models, especially in terms of landscape change - variation in activity over the landscape and over time Such models must focus on dryland and wetland environments, including those below current sea level
23	Return to key excavations, or archives, and develop understandings of sites and regions. Sites mentioned included - Lyles Hill - Newferry - Magheraboy - Others could be listed

24	Increased and centrally supported monitoring of - coastal and wetland environments for archaeological sites of this period, which will be at high risk given pressures in these environments and the likely location of sites in these areas. - plough zone sites to examine information loss

3.7. Methodologies

25	To what extent are the methodologies prevalent in DFA in Ireland today suitable for the recognition of mesolithic and mesolithic-neolithic transition archaeological sites? Following on from this, if alternative methods are required, can these be embedded into practice, especially given likely cost implications?
26	How might survey techniques (field walking, test pitting, geo physics etc) help identify transition sites in Developer-led or other contexts?
27	To what extent are sites of this period present in the 'grey literature'? What is the potential impact of the 'residual' artefacts in the grey literature? One key challenge here lies in assessing the range of ages of cremation burials.
28	Target areas of known mesolithic and neolithic settlement with high resolution multi-proxy palaeoenvironmental work in order to understand signatures of settlement/activity. Use these signatures elsewhere. Applications may be especially important in context of pre-elm decline agriculture.
29	To what extent can new analytical techniques, especially those concerned with examining manuring regimes, contribute to our understanding of early agriculture in Ireland?
30	To what extent can reside analysis/lipids contribute to our understanding of change over time in: - the use of early ceramics - the economy
31	To what extent can thin sectioning contribute to our understanding of the production and distribution of early ceramics?
32	To what extent can starch and phytolith analysis contribute to our understandings of change over time - the economy - use of stone tools
33	Develop all methodologies for dealing with ephemeral field evidence, including maximisation of evidence from artefacts.
34	Develop strategies for testing for archaeological materials in intertidal, wetland and submarine contexts. Best international practice provides the guidelines here.

3.8. Models

35	Model the possible processes of the transition, in its broader European archaeological and climatic context, with clear definitions of archaeological correlates of proposed mechanisms that allow of testing. Such models must avoid the use of the dichotomies that dominate discussion, must remain focused on people in the past and should include consideration of cause, and the archaeological correlates of different causes
36	Can we construct robust models of the practical realities of sea contact at this time, especially those involving animals. Such considerations must include sea level, changes in sea conditions, and due consideration of the archaeological evidence in a European context as well as consideration of relevant anthropological materials.

3.9. Overall Themes

37	Provide an increased understanding of late mesolithic in Ireland. This should include - site distribution and variation in character of activity over landscape - social processes - economy - change over time - proxy and survey evidence for the period - develop theoretical approaches to facilitate interpretation of this material
38	Construct evidence based models of the frequency and nature of contacts between Ireland and the rest of Europe in the late mesolithic and early neolithic.
39	Expand and test dietary isotopic analysis in Ireland. This should include - compound specific analysis - modelling of potential diets
40	Expand and test the use of isotopic evidence for human mobility
41	Assess to what extent is the Ferriter's Cove cattle bone evidence of an 'episode' of contact (e.g. Sheridan) or a singular event?
42	Assess the existence of, and character of, the putative 'Breton' early Neolithic as posited by Sheridan. This should include - identification of settlement evidence to accompany ritual sites - redating of contentious ritual sites, most notably Carrowmore, but if possible, through new investigations of alternative sites - further examination of the contact hypothesised
43	Characterise, identify, and date non-megalithic funerary monuments. Especial emphasis to be placed on the geophysical and aerial photographic signatures of these sites.
44	Find large faunal assemblages on both sides of the transition:, thus facilitating questions about the management of large mammal populations on either side of the transition and aDNA analysis

3.10. Research and Profile

45	Raise the profile of this period amongst: - the public - funding bodies - the archaeological profession
46	Ensure that money is available to sustain research in this period.
47	Create and maintain a broad transition research community both within and outside Ireland, incorporating individuals from many disciplines and sectors of disciplines. Such a community might be based around a research forum (mailing list, newsletters?) rather than regular seminars/lectures. Such a community will have an important role in training, especially about the integration of different data.
48	Support the development of a large scale, multidisciplinary project with European involvement. This project should have a significant knowledge transfer element.
49	Ensure that Irish research plays an important role in discussions at a European level
50	Given recent rise in numbers of researchers working on this topic in Ireland, maintain this focus.

4. Form of Publication of the Challenges

The final form of publication of these challenges deserves consideration. Given the importance of raising the profile of this period amongst the wider public, and the archaeological sector, it seems that any publication should form part of a suite of materials. Internet publication of some, at least, of these should be seriously considered. During discussion many people raised the possibilities of varied publications – from reference guides to material culture through dating protocols to the need for synthetic academic publications. One possible model is:

- summary statement of the challenges for future research (less than 10 pages), made available on line
- summary of the challenges with specific regard to the relationships between development-led archaeology and other research into this period (less than 10 pages), made available on line
- formal academic publication of the project, its methodology and results

Alongside these, several other publications are urgently required, although do not arise directly from this project

- a popular text introducing the period to the broad public
- information sheets, aimed at the public
    - the Heritage Council are currently producing one of these for the Mesolithic, another, specifically focusing on the Transition, should be developed.
- a text aimed at archaeologists in the commercial sector, outlining the particular opportunities and challenges of this period in Ireland.
- Reference guides for material culture, structural evidence etc.

Suggestions relating to the form of publications arising from this project would be very welcome as part of the feedback process.

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6. Details for feedback

Feedback should be sent to Graeme Warren, by 30th June 2008

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8. Appendix 1: Interviewees used for consensus building report

Surname	First Name	Institution	Country
Amkreutz	Luc	University of Leiden	Holland
AYIA	AYIA	Association of Young Irish Archaeologists	Ireland
Baillie	Mike	Queen's University, Belfast	Northern Ireland
Barton	Kevin	Landscape & Geophys. Serv./Earthsound Assoc.	Ireland
Bayliss	Alex	English Heritage	United Kingdom
Bogaard	Amy	University of Oxford	United Kingdom
Bonsall	Clive	University of Edinburgh	United Kingdom
Bradley	Dan	Trinity College, Dublin	Ireland
Bradley	Richard	University of Reading	United Kingdom
Carroll	Judith	Judith Carroll & Co Ltd	Ireland
Cobb	Hannah	Manchester University	United Kingdom
collective	collective	Margaret Gowen Ltd	Ireland
Collins	Tracy	Aegis Archaeology	Ireland
Conneller	Chantal	Manchester University	United Kingdom
Cooney	Gabriel	University College, Dublin	Ireland
Crombé	Philippe	University of Ghent	Belgium
Cummings	Vicki	University of Central Lancashire	United Kingdom
Danaher	Ed	National Roads Authority	Ireland
Davis	Stephen	University College, Dublin	Ireland
Dowd	Marion	Sligo IT	Ireland
Driscoll	Killian	University College, Dublin	Ireland
Edmonds	Mark	University of York	United Kingdom
Edwards	Kevin	Aberdeen University	United Kingdom
Edwards	Robin	Trinity College, Dublin	Ireland
Finlayson	Bill	Council for British Research in the Levant	Jordan
Fredengren	Christina	Discovery Programme	Ireland
Garrow	Duncan	Liverpool	United Kingdom
Hallgren	Fredrik	Uppsala University	Sweden
Johnston	Penny	Eachtra Archaeology	Ireland
Kador	Thomas	University College, Dublin	Ireland
Lewis	Helen	University College, Dublin	Ireland
Lillie	Malcolm	University of Hull	United Kingdom
Louwe Kooijmans	Leendert	University of Leiden	Holland
Mallory	Jim	Queen's University, Belfast	Northern Ireland
Marchand	Grégor	University of Rennes	France
McCartan	Sinead	Ulster Museum	Northern Ireland
McClatchie	Meriel	University College London	United Kingdom
McCormick	Finbar	Queen's University, Belfast	Northern Ireland
Milner	Nicky	University of York	United Kingdom
Mitchell	Fraser	Trinity College, Dublin	Ireland
Mithen	Steven	University of Reading	United Kingdom
Monk	Mick	University College, Cork	Ireland
Mullins	Clare	Byrne Mullins & Associates	Ireland
O'Connell	Michael	National University of Ireland, Galway	Ireland
O'Neill	John	University College, Dublin	Ireland
Price	Douglas T	University of Wisconsin – Madison	USA
Reimer	Paula	Queen's University, Belfast	Northern Ireland
Rowley-Conwy	Peter	Durham University	United Kingdom
Saville	Alan	National Museum of Scotland	United Kingdom
Scarre	Chris	University of Durham	United Kingdom
Schulting	Rick	University of Oxford	United Kingdom
Sheridan	Alison	National Musuem of Scotland	United Kingdom
Smyth	Jessica	Heritage Council	Ireland
Stirland	Jon	ACS Ltd	Ireland
Stuijts	Ingelise	Discovery Programme	Ireland
Sturt	Fraser	University of Southampton	United Kingdom
Tipping	Richard	Stirling Univerisity	United Kingdom
Vanmontfort	Bart	University of Leiden	Holland
Waddington	Clive	Archaeological Research Services Ltd	United Kingdom
Walsh	Fintan	IAC Ltd	Ireland
Whitehouse	Nicki	Queen's University, Belfast	Northern Ireland
Whittle	Alasdair	Cardiff University	United Kingdom
Zvelebil	Marek	University of Sheffield	United Kingdom

9. Appendix 2: Generic Themes used for Collating Information on 'Developments' and 'Challenges'

Generic responses
communication, DFA and academic
data, generate more
databases
dating
Definition of questions
Developer-funded Archaeology
Dichotomies in interpretation
DNA
Environmental Archaeology
Fieldwork: more
Ireland is different
Ireland's ecology
isotopes
landscape archaeology
landscape change
linguistics
material culture studies
mesolithic archaeology
methodologies
Nature of analysis/models
nature of early farming
neolithic package
peripheral location in Europe
preservation
profile, public and profession
proxy evidence
regions/network/contact
research, context and character of
site location/distribution maps
sites, importance of
size
specific interpretative themes
story, has its own
Synthesis of extant data
terminology/definition of periods/material
theory, general developments
training
wetland/underwater archaeology
what developments?

10. Appendix 3: Feedback Form for Prioritising the Research Challenges

Below are listed the 50 questions identified above. Please indicate your opinion of the significance of these questions by using the columns to the right:

1: high significance
2: moderate significance
3: minor significance
4: low significance
5: very low significance

	Challenge	1	2	3	4	5
1	Create and maintain, including all relevant updates, online databases of archaeological evidence dating 4500 – 3500 cal BC. This should contain: - Structural remains - Material culture - Ceramics, lithics (chipped, polished, coarse) - Etc					
2	Create and maintain, including all relevant updates, online database of environmental evidence dating 4500 – 3500 cal BC. - palynolgoical - archaeobotanical - tephras - dates - wood macros - etc					
3	Improve routine dating standards on archaeological sites of this period. This must include robust central guidelines on datings, including - movement to a situation where Bayesian modelling of chronologies is routine - multiple dates are obtained as a norm					
4	What is the timing of the introduction of domesticates? To what extent does this vary across Ireland?					
5	What is the timing of the introduction of ceramics? Establish high resolution robust typo-/techno- chronologies for ceramics. To what extent does this vary across Ireland					
6	What are the changes in stone tool technology (chipped, coarse, ground and polished), from 4500 - 3500 cal BC in Ireland? Establish robust high resolution typo-/techno- chronologies for lithics. To what extent does this vary across Ireland?					
7	At what time period do specific stone tool sources begin to be exploited?					
8	Establish robust dating sequences for the origins of megalithic monuments. To what extent does this vary across Ireland?					
9	Continue to refine dating of early neolithic houses, and other settlement evidence, with especial emphasis on regional variation					
10	Continue to develop the use of genetic evidence for the transition based on both humans and animals.					
11	To provide greater time depth in genetic analysis through increased use of aDNA.					
12	Assess the status of all large mammals, with especial reference to timing of introductions. This should include substantial collaborative work with contributions from DNA and archaeological data.					
13	Develop models of the relationships between biological, cultural and linguistic transmission in Ireland in early prehistory. Such models must remain focused on people in the past.					
14	To publish at least one synthetic paper every decade by archaeologists, geneticists and palaeolinguists critically comparing the available data.					
15	Create island wide models of landscape evolution for 4500 – 3500 cal BC with especial regard to sea level change and river process					
16	Create regional analyses to develop detailed models of landscape evolution for key specific regions (e.g. Sligo, Carlingford). Following from this, use highest international standards, and predictive models where required, to test these environments for archaeological materials (see also below for development of methodologies)					
17	Provide robust, quantified models of climate for the period 4500 – 3500 cal BC. Model the impacts of this climate change on the environment given the understandings of forest structure.					
18	Understand the key factors involved in early Holocene forest structure in Ireland. With especial reference to - the 'grazing debate' - possible role of humans in management through, amongst others, coppicing and clearing - introduction of new large mammals					

19	Identify and date key tephra and micro-tephras for this period					
20	Enable new multidisciplinary field research projects for this period. Such research should have three primary foci - Identify non-palimpsest sites to refine typo-chronology and site function - Target gaps in distribution maps - Provide genuine landscape scale understanding of variation of activity over the landscape.					
21	Find well preserved site(s) spanning the transition. Ideally this/these should be waterlogged, with a full range of environmental proxies, and have a clear stratigraphic sequence allowing chronologies to be generated.					
22	Further our understanding of site location for mesolithic and mesolithic-neolithic transition sites, with especial emphasis on - predictive models, especially in terms of landscape change - variation in activity over the landscape and over time Such models must focus on dryland and wetland environments, including those below current sea level					
23	Return to key excavations, or archives, and develop understandings of. Sites mentioned included - Lyles Hill, esp. Lithic assemblage - Newferry, esp. dating sequence - Magheraboy, regional importance, also need for further work on date					
24	Increased and centrally supported monitoring of - coastal and wetland environments for archaeological sites of this period, which will be at high risk given pressures in these environments and the likely location of sites in these areas. - plough zone sites to examine information loss					
25	To what extent are the methodologies prevalent in DFA in Ireland today suitable for the recognition of mesolithic and mesolithic-neolithic transition archaeological sites? Following on from this, if alternative methods are required, can these be embedded into practice, especially given likely cost implications?					
26	How might survey techniques (field walking, test pitting, geo physics etc) help identify transition sites in Developer-led or other contexts?					
27	To what extent are sites of this period present in the 'grey literature'? What is the potential impact of the 'residual' artefacts in the grey literature? One key challenge here lies in assessing the range of ages of cremation burials.					
28	Target areas of known mesolithic and neolithic settlement with high resolution multi-proxy palaeoenvironmental work in order to understand signatures of settlement/activity. Use these signatures elsewhere. Applications may be especially important in context of pre-elm decline agriculture.					
29	To what extent can new analytical techniques, especially those concerned with examining manuring regimes, contribute to our understanding of early agriculture in Ireland?					
30	To what extent can reside analysis/lipids contribute to our understanding of change over time in: - the use of early ceramics - the economy					
31	To what extent can thin sectioning contribute to our understanding of the production and distribution of early ceramics?					
32	To what extent can starch and phytolith analysis contribute to our understandings of change over time - the economy - use of stone tools					
33	Develop all methodologies for dealing with ephemeral field evidence, including maximisation of evidence from artefacts.					
34	Develop strategies for testing for archaeological materials in intertidal, wetland and submarine contexts. Best international practice provides the guidelines here.					
35	Model the possible processes of the transition, in its broader European archaeological and climatic context, with clear definitions of archaeological correlates of proposed mechanisms that allow of testing.					

	Such models must avoid the use of the dichotomies that dominate discussion, must remain focused on people in the past and should include consideration of cause, and the archaeological correlates of different causes					
36	Can we construct robust models of the practical realities of sea contact at this time, especially those involving animals. Such considerations must include sea level, changes in sea conditions, and due consideration of the archaeological evidence in a European context as well as consideration of relevant anthropological materials.					
37	Provide an increased understanding of late mesolithic in Ireland. This should include - site distribution and variation in character of activity over landscape - social processes - economy - change over time - proxy and survey evidence for the period - develop theoretical approaches to facilitate interpretation of this material					
38	Construct evidence based models of the frequency and nature of contacts between Ireland and the rest of Europe in the late mesolithic and early neolithic.					
39	Expand and test dietary isotopic analysis in Ireland. This should include - compound specific analysis - modelling of potential diets					
40	Expand and test the use of isotopic evidence for human mobility					
41	Assess to what extent is the Ferriter's Cove cattle bone evidence of an 'episode' of contact (e.g. Sheridan) or a singular event?					
42	Assess the existence of, and character of, the putative 'Breton' early Neolithic as posited by Sheridan. This should include - identification of settlement evidence to accompany ritual sites - redating of contentious ritual sites, most notably Carrowmore, but if possible, through new investigations of alternative sites - further examination of the contact hypothesised					
43	Characterise, identify, and date non-megalithic funerary monuments. Especial emphasis to be placed on the geophysical and aerial photographic signatures of these sites.					
44	Find large faunal assemblages on both sides of the transition:, thus facilitating questions about the management of large mammal populations on either side of the transition and aDNA analysis					
45	Raise the profile of this period amongst: - the public - funding bodies - the archaeological profession					
46	Ensure that money is available to sustain research in this period.					
47	Create and maintain a broad transition research community both within and outside Ireland, incorporating individuals from many disciplines and sectors of disciplines. Such a community might be based around a research forum (mailing list, newsletters?) rather than regular seminars/lectures. Such a community will have an important role in training, especially about the integration of different data.					
48	Support the development of a large scale, multidisciplinary project with European involvement. This project should have a significant knowledge transfer element.					
49	Ensure that Irish research plays an important role in discussions at a European level					
50	Given recent rise in numbers of researchers working on this topic in Ireland, maintain this focus.					