Copyright © and Moral Rights for this thesis and, where applicable, any accompanying data are retained by the author and/or other copyright owners. A copy can be downloaded for personal non-commercial research or study, without prior permission or charge. This thesis and the accompanying data cannot be reproduced or quoted extensively from without first obtaining permission in writing from the copyright holder/s. The content of the thesis and accompanying research data (where applicable) must not be changed in any way or sold commercially in any format or medium without the formal permission of the copyright holder/s.

When referring to this thesis and any accompanying data, full bibliographic details must be given, e.g.

Thesis: Author (Year of Submission) "Full thesis title", University of Southampton, name of the University Faculty or School or Department, PhD Thesis, pagination.

Data: Author (Year) Title. URI [dataset]
The Perceptual Validity of Visuo-Spatial Approaches to Landscape Archaeology: Implications for Interpretation, Site Presentation and Perceptual Research

by

Damien Campbell-Bell

Thesis for the degree of Doctor of Philosophy

June 2019
Abstract

Faculty of Arts and Humanities

Department of Archaeology

The Perceptual Validity of Visuo-Spatial Approaches to Landscape Archaeology: Implications for Interpretation, Site Presentation and Perceptual Research

by Damien Campbell-Bell

Visuo-spatial approaches have been a fundamental aspect of landscape archaeology since its inception. Such methods rely on the visual identification and presentation of spatial relationships, and therefore depend on visual perception. It has been argued that visual perception is affected by an individual’s cultural background. If this is the case, then landscape archaeologists will have a different perception of the landscape to the people that they study, and from many of those to whom they present the past. The former brings into question the validity of data used to form archaeological hypotheses. The latter raises concerns for engaging an increasingly diverse public in heritage.

Whilst the extent of cultural influence upon visual perception has been debated widely within archaeology, perceptual research has never been used to inform the discussion. This thesis applies perceptual research to landscape archaeology for the first time, in order to understand the effect of culture upon visual perception. Having established what may be learnt from existing perceptual research about modern populations, archaeological evidence which may give insight into the visual perception of past people is investigated.

In order to understand the effect of culture on visual perception of the landscape, a landscape based perceptual experiment was undertaken. Using the principle of Perceptual Uniformitarianism, the results of this experiment were used to argue that culture does not have an effect upon visual perception of the landscape. It was therefore concluded that the underpinnings of landscape interpretation and presentation were perceptually valid.
### List of Contents

Abstract ................................................................................................................................................ i

List of Contents .................................................................................................................................. iii

List of Tables ...................................................................................................................................... vi

List of Illustrations .............................................................................................................................. vi

List of Accompanying Material .......................................................................................................... xi

Abbreviations Used ............................................................................................................................ xi

1 Visuo-Spatial Perception in Landscape Archaeology ................................................................. 1

1.1 Introduction ................................................................................................................................. 1

1.2 What is Visual Perception? ........................................................................................................... 6

1.3 What is Landscape? ...................................................................................................................... 7

1.4 What is Culture? .......................................................................................................................... 11

1.5 Environment, Context and Presentation .................................................................................... 14

1.6 What Constitutes Visuo-Spatial Data in a Landscape Context? ................................................ 16

1.7 Archaeological Approaches to the Perception of Landscape .................................................. 17

1.8 The Audience in Site Presentation .............................................................................................. 24

1.9 Perceptual Research and Ocularcentrism ................................................................................... 29

1.10 Research Aims, Objectives and Methods .................................................................................. 37

1.11 Summary and Thesis Outline .................................................................................................... 42

2 Visual Perception .......................................................................................................................... 47

2.1 Introduction ................................................................................................................................ 47

2.2 Requirements for Explaining Visual Perception .......................................................................... 48

2.3 Approaches to Visual Perception ................................................................................................ 50

2.3.1 Phenomenology ................................................................................................................... 50

2.3.2 Gestalt Theory ...................................................................................................................... 52

2.3.3 Probabilistic Functionalism .................................................................................................. 54

2.3.4 Psychological Empiricism ..................................................................................................... 55

2.3.5 Ecological Perception ........................................................................................................... 58

2.3.6 The Enactive Approach to Visual Perception ....................................................................... 65

2.3.7 Sense-Datum Theory ............................................................................................................ 71

2.3.8 Extended Cognition and Perception .................................................................................... 76

2.3.9 Electronic Approaches to Understanding Human Vision ..................................................... 85

2.4 Summary and Archaeological Implications ................................................................................. 87

3 Cross-cultural Perception and Perceptual Experiments ........................................................... 93
3.1 Theoretical Implications ........................................................................................................................................ 93
  3.1.1 Affordances ...................................................................................................................................................... 95
  3.1.2 Summary of Theoretical Implications ........................................................................................................... 100
3.2 Illusion and Pictorial Representations ..................................................................................................................... 100
3.3 Real World Perceptual Experiments ....................................................................................................................... 106
3.4 Ecological Motor Theory ........................................................................................................................................... 111
3.5 Conclusions from Perceptual Research Reviews .................................................................................................... 115

4 Archaeological Evidence for Perception ...................................................................................................................... 119
  4.1 Introduction ........................................................................................................................................................... 119
  4.2 Maps ........................................................................................................................................................................ 121
  4.3 Geoglyphs .............................................................................................................................................................. 142
  4.4 Rock Art ............................................................................................................................................................... 146
    4.4.1 Drawing Conventions ....................................................................................................................................... 148
    4.4.2 Gestalt Principles .............................................................................................................................................. 160
    4.4.3 Illusions .......................................................................................................................................................... 163
  4.5 Archaeologies of Colour ........................................................................................................................................... 170
  4.6 Implications for Cross-Cultural Perception ........................................................................................................... 173

5 Applying Perceptual Research to Archaeology ........................................................................................................... 177
  5.1 Perceptual Uniformitarianism .................................................................................................................................... 177
  5.2 The Rationale for a Perceptual Experiment .......................................................................................................... 183
  5.3 Possible Outcomes of this Application of Perceptual Research ............................................................................... 186

6 Methodology .................................................................................................................................................................. 189
  6.1 Introduction ............................................................................................................................................................. 189
    6.1.1 Experiment Overview .................................................................................................................................... 189
    6.1.2 Experimental Aims and Objectives .................................................................................................................. 190
  6.2 Landscape Location ................................................................................................................................................... 192
  6.3 Experiment Impact .................................................................................................................................................. 193
  6.4 Questionnaire Design ................................................................................................................................................ 195
  6.5 Pilot Study .............................................................................................................................................................. 199
  6.6 Fieldwork Method .................................................................................................................................................... 202
  6.7 Analysis and Data Uses ........................................................................................................................................... 206

7 Results ......................................................................................................................................................................... 209
  7.1 Introduction ............................................................................................................................................................ 209
  7.2 Data Analysis ......................................................................................................................................................... 211
List of Tables
Table 4.1- Maps/Images Discussed in Chapter 4 ................................................................. 123
Table 6.1- Demographic Variables .................................................................................. 203
Table 7.1- Participant Demographic Distributions ............................................................. 210

List of Illustrations
Figure 1.1-Proxemic zones and sensory modalities (adapted from Hall, 1966) ................ 333
Figure 2.1-The Müller-Lyer illusion. The line on the left is perceived to be shorter than the one on the right, when they are in fact of equal length. ................................................................. 49
Figure 2.2- Examples of Gestalt principles. (a) An example of Rubin’s Vase, a figure/ground relation (b) A demonstration gestaltqualitäten (c) A demonstration of prägnanz ........................................ 53
Figure 2.3- An anaglyph image of the Müller-Lyer illusion (Gregory, 1998). When viewed with colour coded/ anaglyph glasses the illusion disappears ......................................................... 54
Figure 2.4- A Necker Cube. Although a two-dimensional drawing, this is perceived as a three-dimensional object .................................................................................................................. 56
Figure 2.5- The Devil’s Pitchfork. Again this is a two-dimensional drawing which is perceived as being three-dimensional ........................................................................................................ 57
Figure 2.6- The hollow mask illusion (Gregory, 1998). When properly illuminated the rear of a mask appears to be a face with protruding, rather than inverted features. ............................... 57
Figure 2.7- The Titchener Illusion. Both central circles are the same size however the context of the outer circles alters our perception of their size ................................................................. 67
Figure 2.8- The spot in shadow appears to be lighter than the other. The overlapping spots on the right show their actual colours. ................................................................................ 75
Figure 2.9- The spot in shadow now appears to be darker as it is genuinely in shadow. The overlapping spots on the right show their actual colours. .......................................................... 75
Figure 2.10- The spot in shadow now appears to be the same colour when it is in fact considerably darker. This is the result of the same process as in figure 2.9. The overlapping spots on the right show their actual colours .................................................................................. 76
Figure 3.1- A modified Müller-Lyer illusion. The line on the left is perceived to be shorter than the one on the right, when they are in fact of equal length ................................................. 101
Figure 3.2- Images used by Hudson to represent depth cues in horizontal space (Hudson, 1960). .. 103
Figure 3.3- The drawings which Deregowski asked subjects to make with clay and sticks (Reproduced from Deregowski, 1972).................................................................................................................................................................................. 105

Figure 3.4- The holders in which the kittens were placed. B shows a kitten from a different experiment using the same holders, demonstrating that the kittens were able to move their heads (Walk, 1979)................................................................................................................................................................................... 109

Figure 4.1- “Map” of Çatalhöyük (Mellart, 1964). .................................................................................................................. 124

Figure 4.2- Possible Upper Palaeolithic picture map from Penalsordo, Badajoz, Spain. A cave painting interpreted as two people within a hut or enclosure (Breuil, 1933). .......................................................... 125

Figure 4.3- Possible Upper Palaeolithic picture map from Mezhirichi, Ukraine. An engraving on mammoth tusk interpreted as four riverside dwellings and fishing nets within the river (James and Thorpe, 1995).......................................................................................................................... 125

Figure 4.4- Picture map of a prehistoric village which obeys the rules of topology from Cangyuan, Yunnan, China (After Wang, 1985: 35). .................................................................................................................. 125

Figure 4.5- Examples of petroglyphs interpreted as plans of yurts and stockyards from Murgur-Sargol, Sayan Mountains, Siberia (Devlet, 1975; 1980, as presented in Delano-Smith, 1994). ......................... 126

Figure 4.6- Interpretation of Block 1 from Abauntz cave, Navarra, Spain (Utrilla et al., 2009). ....... 127

Figure 4.7- Simple topographic figures from Val Fontanalba, Monte Bego (Bicknell, 1913). Public domain ................................................................................................................................................ 129

Figure 4.8- Bedolina R7 Seradina-Bedolina, Capo di Ponte (Maretta, 2013). ............................................. 129

Figure 4.9- Complex topographic figure from Valcamonica (Priuli, 1985). .................................................. 130

Figure 4.10- Bedolina 1, a complex topographic figure from Bedolina, Valcamonica (Footsteps of Man Archaeological Cooperative Society, used under Creative Commons Licence CC-BY-SA-3.0)........ 130

Figure 4.11- The “Monte Bego Village” Map. Delano-Smith reinterpreted it as four simple topographic figures (b-e) and one complex one (a) (Bicknell, 1913).................................................. 131

Figure 4.12- Examples of crop marks which resemble topographic figures. A and D Fenner and Dyer, 1994; B- A section of Figure 3 Carpenter et al., 2016; C- Historic England, 2018........................................... 134

Figure 4.13- Clay tablet of Nippur circa 1500 BC (Hilprecht Collection, Friedrich-Schiller-Universität, Jena). Public domain ........................................................................................................................... 135

Figure 4.14- The Turin Papyrus as reconstructed by Harrell and Brown (1992). Public domain........ 136
Figure 4.15- Marshallese Rebbelib stick chart. This chart represents the majority of the Marshall Islands. (Winkler, 1901; Museum für Völkerkunde, Berlin). Public domain................................................................. 137

Figure 4.16- Juan Antonio Cantova’s map of the Caroline Islands, produced in 1722 from information provided by natives of the islands that had landed on Guam, where Cantova was stationed (Du Halde, 1709-1743). Public domain...................................................................................................... 139

Figure 4.17- Chart produced by Otto von Kotzebue in 1817 covering the Ratak and Ralik chains of the Marshall Islands. (von Kotzebue, 1821). Public domain................................................................. 139

Figure 4.18- Chart produced by James Cook displaying the geographic knowledge of the Tahitian Tupaia (British Library). Public domain........................................................................................................... 140

Figure 4.19- A) Wetalltok’s map of the Belcher Islands. (American Geographical Society Collection, University of Wisconsin-Milwaukee Library). Public domain. B) Satellite image of the Belcher Islands, demonstrating the map’s accuracy (Google, Landsat/Copernicus)........................................................................................................... 140

Figure 4.20- Nasca Geoglyphs. The Condor, Hummingbird, Spider and Monkey (Diego Delso, delso.photo, used under Creative Commons Licence CC-BY-SA-4.0).................................................................................. 143

Figure 4.21- Nasca Labyrinth Geoglyph (Ruggles and Saunders, 2012).............................................. 144

Figure 4.22- Nasca Labyrinth geoglyph illusion of parallel lines (Ruggles and Saunders, 2012)........ 145

Figure 4.23- Possible Palaeolithic geoglyphs representing a rhino and two elephants (Mailland, 2012). .................................................................................................................................................. 146

Figure 4.24- Rhinos with interlocking horns from Chauvet Cave (Detail of a larger image from Chauvet et al., 1996). .................................................................................................................................................. 1499

Figure 4.25- A) Panel of the lions showing occlusion between the top rightmost lions B) Highlighted examples of occlusion- Blue occludes Green, Purple occludes Blue and Red (Adapted from Chauvet et al., 1996). .................................................................................................................................................. 150

Figure 4.26- Multiple occluding rhinos from Chauvet Cave (Adapted from Chauvet et al., 1996). ...................................................................................................................................................... 151151

Figure 4.27- A) Complex scene of occlusion from Chauvet Cave B) Green potentially occludes Red, Purple and Blue occlude Green, Turquoise occludes and is occluded by Green (Adapted from Chauvet et al., 1996). .................................................................................................................................................. 151

Figure 4.28- Bronze Age Shoemaker carving from Bohuslän, Sweden. (Courtesy of Regina Hoff). ... 152
Figure 4.29- Bronze Age carving from Bohuslän, Norway. (Foundation of Bohuslän Rock Carvings, 2003) ................................................................................................................................................... 152
Figure 4.30- Bronze Age carving from Bohuslän, Norway. (Foundation of Bohuslän Rock Carvings, 2003) ................................................................................................................................................... 153
Figure 4.31- Simple and complex occlusions in San rock art (Adapted from Figure 75, Lewis-Williams and Dowson, 1999). ................................................................................................................................................... 153
Figure 4.32- Intersecting cup and ring marks from Achnabreck, Argyll (Part of Plate 11, Bradley, 1997). .................................................................................................................................................. 154
Figure 4.33- Cup and ring marks from Cairn L at Carnbane West, Ireland (Twohig, 2012: 133) ....... 155
Figure 4.34- Diminishing size on the Shoemaker panel (Goldhahn et al., 2010). ............................... 156
Figure 4.35- Foreshortening and use of wall shape (Chauvet et al., 1996). ....................................... 157
Figure 4.36- Examples of thickened and doubled lines showing thickness/depth of an animal (Chauvet et al., 1996). ................................................................................................................................................... 157
Figure 4.37- Scene from Phillip II of Macedon’s tomb complex, showing foreshortening, for example on the chariot wheels (Wikipedia, Public Domain) ................................................................. 157
Figure 4.38- Examples of foreshortening in San art (Lewis-Williams and Dowson, 1999). ............... 158
Figure 4.39- Art from Altamira Cave with foreshortening and multiple methods of overworking (Thomas Quine, used under Creative Commons Licence CC-BY-SA-2.0). ................................................................. 159
Figure 4.40- Bison painted upon protrusions of Altamira cave ceiling (Matthias Kabel, used under Creative Commons Licence CC-BY-SA-3.0) ........................................................................................................ 159
Figure 4.41- Dot arrangements showing prägnanz. A- El Buey rock shelter, Bolivia. B- Arvoredo Island, Brazil. C- Campeche Island, Brazil (Bradshaw Foundation, 2011). ................................................. 161
Figure 4.42- Dot arrangements showing prägnanz to create animal forms. A- Bison from Chauvet Cave (Chauvet, 1996) B- Snakes from Huanuyoj, Bolivia (Bradshaw Foundation, 2011). .................. 162
Figure 4.43- Dot arrangements and incomplete animals from Panel 78, Cave of La Pasiega, Spain (Hoffman et al., 2018). ........................................................................................................................ 163
Figure 4.44- An illusion showing the brain’s assumption that light comes from above. .................. 164
Figure 4.45- The upper panel at Cairnbaan (Jones, 2012: 86). A- As originally presented. B, C and D- Image rotated to show depth ambiguity. ........................................................................................................ 165
Figure 4.46- Beanley Moor 1, Northumberland. A appears concave and B appears convex (ERA: England’s Rock Art) ............................................................................................................................. 166

Figure 4.47- Blairbury 6 cup and ring carving. A shows the carving lit from the top left. B shows the carving lit from the bottom right and the apparent depth has been reversed (RTI file courtesy of Joana Valdez-Tullett) .......................................................................................................................... 168

Figure 4.48- Roundels on a gravestone from the Old Church of St. Nicholas, Uphill. A shows the light from the top, with the roundels appearing their correct shape. B shows the light from below, with the ridges appearing to be indents (RTI file courtesy of Wessex Archaeology) ................................................................................................................. 168

Figure 4.49- Carving on the wall of the Old Church of St. Nicholas, Uphill. A shows the light from the top, B shows the light from below. ............................................................................................................................. 169

Figure 7.1- Q1. What do you notice about the sizes of the Cursus Barrows? ........................................... 212

Figure 7.2- Q2. What do you notice about the location of the King Barrows? ........................................... 212

Figure 7.3- Q3. If you can, describe the distribution of the King Barrows .................................................. 213

Figure 7.4- Q4. What do you notice about the relationship between the stone uprights and the ditch of Stonehenge? ................................................................................................................................. 213

Figure 7.5- Q5. Describe the relationship between the two barrows to the left of the fence running towards Normanton Down ................................................................................................................. 214

Figure 7.6- Q6. Describe the horizon around Stonehenge ............................................................................ 215

Figure 7.7- Q7. What do you think is the highest point in the landscape? .................................................. 215

Figure 7.8- Q8. Describe the relationship of the road to the landscape ...................................................... 216

Figure 7.9- Q9. Describe the terrain of the landscape .................................................................................. 216

Figure 7.10- Q10. The Cursus Barrows are .................................................................................................. 217

Figure 7.11- Q11. Describe the role of the Cursus in the landscape ............................................................ 217

Figure 7.12- Q12. The King Barrows ........................................................................................................ 218

Figure 7.13- Q13. The Normanton Down Barrows are .................................................................................. 219

Figure 7.14- Q14. Describe the relationship between the two barrows to the left of the fence running towards Normanton Down ................................................................................................................. 219

Figure 7.15- Q15. Describe the distribution of the Normanton Down Barrows ........................................... 220
Figure 7.16- Q16. What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?.......................................................................................................................... 221

Figure 7.17- Q17. Describe the horizon around Stonehenge ............................................................. 221

Figure 7.18- Q18. Which is the closest to Stonehenge, Normanton Down or Cursus barrows?........222

Figure 7.19- Q19. Describe the distribution of the ancient man made things in the landscape........ 223

List of Accompanying Material

- Anaglyph glasses
- Appendix DVD- Contains Appendices 4-8 and 10-13

Abbreviations Used

EH- English Heritage

CRM- Cultural Resource Management

RTI- Reflectance Transformation Imaging
Research Thesis: Declaration of Authorship

<table>
<thead>
<tr>
<th>Print name:</th>
<th>Damien Campbell-Bell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of thesis:</td>
<td>The Perceptual Validity of Visuo-Spatial Approaches to Landscape Archaeology: Implications for Interpretation, Site Presentation and Perceptual Research</td>
</tr>
</tbody>
</table>

I declare that this thesis and the work presented in it is my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;

2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;

3. Where I have consulted the published work of others, this is always clearly attributed;

4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;

5. I have acknowledged all main sources of help;

6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

7. Either none of this work has been published before submission, or parts of this work have been published as: [please list references below]:

   - ...................................................................................................................
   - ...................................................................................................................
   - ...................................................................................................................

Signature: 

Date: 

1 Visuo-Spatial Perception in Landscape Archaeology

1.1 Introduction

Landscape archaeology has been defined as the study of past cultures through traces left in the landscape (Chapman, 2006). Whilst other forms of landscape study exist, a significant proportion of landscape archaeology studies use visuo-spatial approaches which rely on the identification and interrogation of spatial patterning in the remains of these cultures. This includes study of orientation, grouping, proximity, configuration and placement. These patterns are usually identified and presented visually and have been key to landscape studies since the very earliest examples, undertaken by the likes of Williams-Freeman and the Earthwork Committee of the Congress of Archaeological Societies (Crawford, 1960; Johnson, 2007; Williamson, 1998). These approaches constitute a search for visual structure in landscapes, and in the last twenty five years have been made explicit through phenomenology and the use of GIS.

W. G. Hoskins maintained that the landscape could be decoded through careful observation of its physical characteristics, without the need for intervening theory (Johnson, 2007: 48) and was a key figure in formulating the current state of landscape archaeology (ibid.; Aston and Rowley, 1974: 19; Roberts, 1987: 79), if not directly, through his influence on the work of archaeologists still widely read. Whilst this disregard for theory is no longer upheld, the emphasis on landscape observation unlocking meaning is still prevalent (see for example Tilley, 1993; 1994; 2004; Barrett, 2005; 2006; Bowden, 1999; Van Dyke, 2003; Cummings and Whittle 2004; Johnson, 2007).

Such observational methodologies are often viewed as an empirical and atheoretical data collection strategy (Johnson, 2007); though not always explicitly stated, it is implicit in many landscape studies (see for example Pollard and Reynolds, 2002; Cummings and Whittle, 2004; Brophy and Millican, 2015; Jones et al., 2015; Llobera, 2015). However, the aim of most archaeological discourse is not one of completely objective empiricism. Archaeology aims to answer questions about the past, to infer meaning from research and to build up a detailed understanding of past people’s lives. Once identified, these patterns are used to form theories about different topics, including relationships with nature (Bradley, 1998) beliefs about the
afterlife (Barrett et al., 1991), the behaviour and identities of past people (Branton, 2009),
and socio-political relations (Anschuetz et al., 2001). Given these interpretive links, data
collection cannot be considered in isolation from theory.

There is a question of data validity with visuo-spatial approaches to landscape archaeology;
data collection is an act of interpretation (Hodder, 2000a: 5; Hamilton, 2011: 266), and in this
case that interpretation is based on the physical act of perception (as opposed to higher order
meanings of the word, a distinction which will be explained in Section 1.2). Perceptual
research offers differing opinions on whether, and to what extent, culture affects visual
perception, and genetic evidence has demonstrated that gene-culture interactions can cause
non-trivial changes to a groups’ genome (Laland et al., 2010). Given that people within past
(and therefore different) cultures are the focus of much of archaeological study, there are
potentially serious implications for our data collection and how we interpret the past. It may
be that we are simply not seeing the right data (or all of the relevant data); the attributes we
identify in the landscape may differ from those which were relevant to, and perceived by past
people. If this is the case, then the archaeological data collected is not the right data for
understanding past people and there is therefore an epistemic problem in many visuo-spatial
approaches to landscape study. Landscape studies which focus purely on the gathering of
facts, or the description and explanation of processes, such as Aston’s (2001), or those in the
“journals of record” (Johnson, 2011a: 767), do not face the same issues, as they do not seek
to explain meaning and intention from the perspective of past people in the same way.
However, many landscape studies go beyond concerns of what, how and where, and ask why
past people did things the way they did (see for example Barrett et al., 1991; Bradley, 1998;
Anschuetz et al., 2001; Branton, 2009).

The issue of cross-cultural perceptual variance has been raised by a number of
archaeologists including Bender (1993), Thomas (1996) and Hirsch (1995), but it is often
simply dismissed (see for example Thomas, 2001). When addressed, little evidence tends to
be used to support any claims made. A more detailed account of archaeological approaches
to perception will be given in Section 1.7, but for now it is important to note that whilst this
issue was discussed in the 1990’s and early 2000’s, the focus on rhetoric over the investigation
of perception meant that there was never a resolution. In more recent years theoretical
debate has moved on, and this issue has been mostly ignored. Some landscape studies still refer to it (Hu, 2012; Skeates, 2010; Spring, 2015), but many carry on as if there is no problem in taking the data that they collect at face value (see for example Brophy and Millican, 2015; Scarre, 2015; Flores, 2017 and Monteith, 2017). In making its interpretations, such work therefore implicitly assumes that past people perceived in the same way as modern people. Lucas (2015: 312) has noted that “it is very unfashionable to talk about the limits of archaeological interpretation or inference these days”; this may be one reason for the current lack of engagement with this issue. In contrast, Gibbon (2005) has highlighted a trend amongst some archaeologists, since the 1980’s, of accepting sceptical stances that nothing can be known about the past; Shanks and Tilley’s (1992) *Reconstructing Archaeology: Theory and Practice* is a prime example of this. None of these approaches bring us closer to understanding the validity of archaeological data collection in visuo-spatial approaches to landscape, nor the interpretations and presentations built upon them.

Whilst this issue is a concern for archaeological research, it is also relevant to the presentation of archaeological interpretations to the public. While the debate about cross-cultural variance in perception occurred in landscape archaeology, museums were also critiqued due to inherent biases and cultural influences (Buckley, 1996; Merriman, 1999a; Wood and Cotton, 1999; Labadi, 2018). In contrast to archaeological interpretation, however, this issue has remained current, with some museums responding and others still being called to do so (Frodsham, 2004; Skeates, 2017). It is widely recognised that archaeologists should be presenting an authentic past to the public, but if we do not have the right data for our interpretations is this possible? There are also concerns about responding to the varying needs of different groups within the public (James, 1999; Mckercher and du Cros, 2002; Kaufman, 2004; Skeates, 2017) and some have suggested that they bring their own differing perception to bear when visiting sites and museums (Owen, 1999; Sørensen, 1999; Hooper, 2000; Alpin, 2002; Okpoko and Okonkw, 2005). If this is the case, as one can plausibly argue if visual perception does vary between cultures, then certain groups within the public may not be able to pick up on the attributes and relationships that archaeologists are presenting. Consequently, we are then failing at a fundamental aspect of archaeological practice (Carver, 2004; Frodsham, 2004; Liwieratos, 2009). Despite the overlapping issues, cross-cultural variation in visual perception has not been a major topic of discussion within archaeological
presentation. This is likely due to the majority of the literature focusing on museums rather than archaeological landscapes.

Having raised these issues we might also question cultural resource management (CRM) practice. CRM depends upon identifying what is significant about a site or landscape (Historic Scotland, 2000; Liwieratos, 2009; King, 2016), but if the validity of our data is in question due to cross-cultural variation in visual perception, then we cannot be certain what is truly significant. This may vary between different cultural groups within the public and be different from that which was seen as significant by past people. The management archaeologists undertake affects what information is preserved, and how a site is experienced and understood (Matero, 2010). This may have an impact on the visiting public and opens up questions of what should be protected and managed, what should not, and whether we might be allowing archaeologically significant features to fall outside of CRM remits.

Given this broad range of concerns it is unsurprising that Maschner (1996: 305) argued that investigating how people perceived landscapes might be one of the biggest future contributions to archaeology. The fact that this is no longer part of the theoretical vogue, and that work on archaeological presentation and CRM has not extensively engaged with the issue, does not mean that it does not require further investigation. Acceptance that there are limits to interpretation is not enough; those limits need to be defined (Lucas, 2015: 313) and the underlying frameworks of thought/perception need to be made more explicit, and their implications critiqued (Gibbon, 2005: 70). This thesis aims to do this with visuo-spatial approaches to landscape archaeology.

The research question of this thesis is therefore “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?” This question is vitally important if we are to truly understand what it is that we are doing as landscape archaeologists; are we really investigating and presenting the past, or are we merely reflecting ourselves?

Since we are temporally separated from the people of the past investigating this cannot be done directly. Nor can it be done through the uncritical use of ethnographic material; the subjects of ethnography are modern people with their own culture, and do not necessarily
bear any relation to past people, even if similarities can be found in practices or material culture. Instead we must use the archaeological record in the present, and develop the “structures of inference” proposed by cognitive archaeologists such as Renfrew (1994: 5) to help us construct a perceptual framework. The first step towards this should be an analysis of perceptual theory, in order to ascertain what existing perceptual evidence can offer insight on this issue. This will be the focus of chapters 2 and 3, once the archaeological background of this thesis has been further explored. As there is little consensus on how perception functions, or on how culture affects it (and little knowledge of perceptual research amongst most archaeologists), the competing claims will be examined in detail. This thesis does not start from a particular perceptual standpoint, but aims to discern the most convincing theory through reviewing the evidence.

This thesis differs from existing archaeological work that addresses cross-cultural variance in perception in two key ways. The first is a detailed examination of perceptual research. The second is the use of a new concept, Perceptual Uniformitarianism (see Chapter 5), and a perceptual experiment in the Stonehenge landscape, which examines cross-cultural variance in visual perception in a landscape context. This experiment will be the first time evidence has been gathered in relation to the potential perceptual gap between modern and past people. It also distinguishes this work from previous cross-cultural perceptual research which has focussed on laboratory and illusion based studies of perception.

Before going any further, it is important to define a number of terms, especially those of landscape and visual perception, as both have many varying connotations. There are many varying, and in places, contradictory definitions for the key terms used in this thesis, and the readers’ interpretations will no doubt differ from my own and each other’s. However, one must choose a definition to use; definitions serve as the bedrock for further study, since all work will relate back to them, defining what is and isn’t appropriate to discuss. To choose a non-archaeologically sensitive example, if a study into football defines it as soccer, it cannot be criticised for not considering American football or rugby football, since these sports are not coherent with the definition used. Instead, a discussion must be had on definition. One may disagree with the definitions of a study, but given those definitions, its arguments may be perfectly sound. Of course, this is not a free pass to do whatever one wishes through word
games. If a study’s terminology is completely at odds with what any reader would consider reasonable, then whatever arguments it may make, it ceases to have any value. As such, researchers must establish definitions which suit the needs of their work and serve to avoid confusion, but which are grounded in evidence and shared understanding. In order that the arguments of this thesis be equally intelligible, no matter the reader’s background, for the purpose of this research the definition of landscape, perception and some other key terms will be those detailed below.

1.2 What is Visual Perception?

Visual perception is the register, or pick up, of certain fundamental qualities of the world, via light, through the use of the eyes. This includes attributes such as shape, size, colour, location and perhaps, if Gibson (1986) is correct, basic affordances (ways in which we may put something to use). Visual perception of landscape features includes spatial relationships such as proximity, grouping, division etc. as well as individual characteristics. The purpose of perception is not for an individual to convert the physical world into a meaningful environment, but to keep observers in contact with their surroundings and thus facilitate action.

For the purpose of this research, the perception to which I refer is limited to the literal meaning of the word as sensory experience; therefore, things such as aesthetics, personal preferences, value judgements or the assignment of meaning are not considered as a part of visual perception. Instead, they are treated as higher order mental processes that directly build upon the information gathered by the basic, or primary, act of perception; this distinction is developed further in Chapter 5. This does not mean that these higher order processes are not important, merely that any influence that they have comes after that of perception. This thesis aims to understand the primary elements of landscape perception, so that further work can be built on solid foundations.

The use of the word perception in this thesis is therefore very strict, focusing only on basic sensory experience as described by psychological research. This differs from its multifaceted use in colloquial language and in much archaeological work outside that done by cognitive archaeologists (see for example Malafouris and Renfrew, 2008). Chapter 2 will go into more
detail about how we perceive and serve to demonstrate the validity of this definition of visual perception.

1.3 What is Landscape?

Many works of landscape archaeology either fail to define the term landscape, or give only a brief definition. This assumes that the term is straightforward, and unproblematic; but to define landscape in a way that is acceptable to all archaeologists is likely an impossible task, given the term’s long history of use (Anschuetz et al., 2001). As such, this section serves to explain what landscape means for this research. To begin with it is appropriate to give an overview of how the term has previously been used in archaeology.

Landscapes have been defined over a broad range of scales (Anschuetz et al., 2001; Branton, 2009; Rotman, 2009), for many studies though, landscape represents an intermediate scale of human experience (Denham, 2017). Temporality is also a key concern, the landscape is never static (Anscheutz, et al., 2001: 161; Denham, 2017: 464). Beyond this, landscape is understood in many different ways.

Tilley (1994) has divided landscape definitions into two main categories, the scientific view, in which the landscape is quantifiable, objective and static, and the humanised view, in which it is qualitative, subjective and dynamic. There is large variation within such broad categories though. At the most basic level landscapes have been conceived of as a background against which archaeological material can be plotted (Knapp and Ashmore, 1999: 1; Rotman, 2009). Landscapes have also been described as physical spaces that are perceived and utilized by people, or as an assemblage of natural, semi-natural and artificial features (Hood, 1996: 123; Roberts, 1987: 79; Anschueut, et al., 2001; Branton, 2009). Modern approaches tend to stress the interplay of the natural and the man made, with landscapes sometimes being seen as in some way active in the lives of their inhabitants (Knapp and Ashmore, 1999: 2; Branton, 2009).

A long-standing view is that the landscape is a palimpsest, which can be read like a text, revealing traces of past action (Aston and Rowley, 1974: 14; Rotman, 2009: 81-82). For many, landscapes also hold meaning; this meaning can change depending on the person or group interacting with the landscape, and so the same landscape can hold multiple meanings, contiguously and concurrently, resulting in what is sometimes referred to as nested
landscapes (Shanks and Tilley, 1992; Knapp and Ashmore, 1999; Rotman, 2009; Branton, 2009; Hu, 2012). Meaning creates landscapes that are the context for learning culture, and the reaffirmation of social structure (Hood, 1996: 121; Anscheutz, et al., 2001: 161). Landscape has also been seen as primarily a symbolic environment, in which human acts confer meaning to nature via culture (Greider and Garkovich, 1994: 1). Knapp and Ashmore (1999: 1) have even described landscape as existing only by virtue of it being experienced and contextualized by people. Landscapes are also defined by their location, whether that be in terms of topography, geology or ecology, or from a cultural stand point, technologically, cosmologically, or with centrality/liminality (Anscheutz, et al., 2001; Tilley, 1994).

These are just some of the ways in which the term landscape has been used; there are more within archaeology, and even more in other disciplines. To cover them all in any detail would be an extensive piece of work. Whilst there are areas of overlap, there are also many differences. For archaeology, it seems, landscape is what you need it to be, even to the extent that one may use seemingly disparate definitions at the same time (Hu, 2012: 81).

It is worth addressing the topic of meaning in more detail before outlining the definition of landscape used in this thesis, as it is this that can be seen as one of the key differentiators between the two main strands of archaeological thought on landscape which Tilley (1994) has described. Humanistic approaches to landscape see meaning as an integral part of the term (Denham, 2017: 465) as it can play a significant role in people’s interaction with that landscape (Hood, 1996: 121; Anscheutz, et al., 2001: 161; Rotman, 2009), however, this does not mean that the meaning is a fundamental part of what landscape is. Meaning changes according to the individual in that landscape; it is a relational, emergent property. It is for this reason that landscapes are often described as being imbued with meaning; the meaning comes from people, not from the landscape. The landscape itself is in fact something separate, something physical. For it to be otherwise would prevent different meaning being assigned to it by different people. Landscape archaeologists often confuse this issue, taking the idea that landscapes are meaningful, to necessitate that meaning is an inherent part of what that landscape is.

To further make the distinction between landscape and the meaning attributed to it, we might return to the concept at the heart of this thesis, data. Landscape archaeology does not,
at least in most cases, use meaning as its data. Instead, it uses the physical aspects of the landscape, be they cultural or natural, and then interprets meaning from that data. Even meaning which an individual identifies for themselves could not be considered the data of landscape archaeology, or indeed of landscape perception, since it must necessarily be built upon the evidence gathered by the senses; the assignment of meaning is a higher order cognitive function. There is then a real landscape, perceivable by multiple different individuals, which is prior to any form of meaning. The question for this thesis is whether that real landscape is accessible to us, or if even our very perception of it is influenced by demographic factors such as culture.

Having considered the above, for the purpose of this thesis, landscape is the fixed, physical, temporally durable, built and natural features of an area, whether natural or anthropogenic, grown or modified. Animals, people and vehicles are thus not a part of the landscape, whilst hills, valleys, trees, barrows, settlements etc. are. Although people and animals may be seen as an integral part of an area’s character by local inhabitants, they are by their very nature transient and mobile; they are not specific to that area, but can occupy multiple areas contiguously. They may not move out of the area, but the fact that they can means that they are not features that have set relationships with those around them. As an example, if you were to look at the same hillside on two different days, you would think little of the fact that a farmer was no longer visible in a field, or was in a different location, but the disappearance of a lone tree in the same field would be of note. To move a tree means a disruption of a natural cycle and replanting it, to move a monument or a house means rebuilding it and moving a hill would involve reconstructing it. Each of these involves the prefix re-; they are an unmaking or undoing and subsequent remaking/redoing, whereas a person, animal or vehicle simply moves. You may move again, or move back (admittedly known as returning, but this does not mean ‘turning again’), you do not re-move. Instead, to remove something is to take it away, with the implication that its position would otherwise not be transitory. It seems then that there is an ontological distinction here, reflected in the English language.

Features of the landscape are fixed, in that they are not able to move themselves across the ground and their movement by active agents is not typical. Mobile entities can become part of the landscape; a ruin of a vehicle can remain where it is, and a person’s remains may be
incorporated into the landscape. Again, the distinction here is based on mobility; these things have become immobile, for a time at least. Landscape features are understood to have a sense of permanence to them, even if in fact that permanence is relatively short lived. They are defined by their potential, or expected, temporal duration. Something which is regarded as fleeting would not be seen as part of the landscape, whereas something which lasts and remains mostly static (at least in terms of a human lifespan) is. A hillside may change over many years due to erosion, or a tree may grow considerably, but the rate of change is too slow to see day to day. Equally, a building can be considered part of the landscape as one would expect it to last a long time. It may in fact be knocked down at any time, but the potential and expectation of a long duration make it a landscape feature. A new building would thus be a new part of the landscape. Indeed a hillside may also rapidly change, in a landslide for example, but it is no doubt a part of the landscape. As these temporally durable features slowly (or on occasion rapidly) change, so the nature of the landscape changes.

Whilst this definition is relatively straightforward, this concept of temporal durability does introduce a complication which needs addressing. Some features have a long potential duration, but a short expected one; a building site, for example. This might be considered a transition, however events may transpire such that the project stops, and as time goes by without any change the inhabitants of the landscape may begin to expect the building site to last for a long time. At this point it may be considered a part of the landscape, although interestingly, only to those familiar to the area. New visitors who are unaware of its state may wrongly attribute it a transitory status. What is and is not part of the landscape thus depends on familiarity, or assumptions about the features within it. This therefore requires some prior understanding. So to look at new/unfamiliar landscapes, one needs to have some knowledge of what to look for, but not necessarily what meanings are attached to certain features. In the context of archaeological landscape studies, this is where archaeological knowledge and experience plays a role; determining what may be of relevance. Of course, this perception of features for archaeological purposes is predicated on the very topic of this thesis.

The features that fulfill these criteria of being physical, fixed and temporally durable, as a group, make up the landscape. Landscape is thus not a cultural overlay, or people’s thoughts, beliefs and actions within an area; for the purpose of this research landscape is the physical
attributes of an area, before any of this has been layered on top. It is ontologically basic and thus prior to these additional layers, and it might therefore be described as landscape stripped back to its bones, removed of its explicit cultural baggage. To deal with it in any other way would make an investigation of the effect of culture on visual perception of the landscape, and arguably landscape archaeology in general, impossible, since we would be dealing with inherently different landscapes from the very start. Instead, this research aims to work up from this base level to assess what we can and cannot be sure about when discussing landscapes. It is important to recognise that this does not just include topography, there are a host of natural and anthropogenic features that make up a landscape, but they all exist as physical entities in the world rather than anything in the individual, or collective, consciousness. This definition also serves to reinforce the idea that we are not seeing the same landscape as past people, but something which has gradually altered over many lifetimes.

1.4 What is Culture?

As with visual perception and landscape, culture has been defined in different ways. Ingold (2002: 329) notes that “the concept of culture... has obstinately resisted final definition”, whilst Knudson (1978: 85) asserted that the term was a conceptual tool that had been used in hundreds of different ways in anthropological and archaeological research. Nonetheless, the importance of definitions has already been established, and so before proceeding, culture must also be defined for the purpose of this thesis.

The first point which must be made is that this thesis does not refer to culture in the sense of an archaeological culture, a people defined by similarities of archaeological remains. Instead it is in the more anthropological sense that the term is used. The very idea of culture having an effect upon our visual perception likely emerged from anthropological definitions of the term; Franz Boas established the idea of culture as a lens through which we see the world in the early 1900s (Monaghan and Just, 2000: 38).

Ingold (2002: 332) has posited that there are two broad views within anthropology on what culture is. The first, a cognitivist approach, sees culture as conceptual information which is transmitted between individuals, whilst a phenomenological approach sees culture as the
human relationships which provide the context in which people grow up (ibid.). These different approaches lead to the differing conceptions on what may cause perceptual differences between cultures; the former suggesting variance in conceptual schema, and the latter variance in bodily and perceptual experience (Ingold, 2002: 331).

The most basic definitions of culture describe it as a “way of life” (Monaghan and Just, 2000: 38; Ingold, 2002: 329; Byrne, 2008: 150). This is commonly expanded to politics, beliefs, symbols, values, laws, subsistence system, domestic and social organisation, knowledge, art, technology, customs and material objects (Knudson, 1978: 85; Fagan, 1991: 70; Byrne, 2008: 150-151; Johnson, 2010: 18, 73; Kronenfeld, 2017: 4). This holistic view of culture is frequently presented, and often cited as originating with Tylor (1871). It is not universally held however, with some such as Shennan (2004: 9), arguing that culture does not organise everything. Instead, it is described as a group of traditions whose components persist together over time, forming a basic framework for social life (ibid.). A related definition of culture is that it is every non-biological characteristic that makes one society distinct from another (Byrne, 2008: 151; Renfrew and Bahn, 2012: 12; Kronenfeld, 2017: 4, 9).

More specific definitions of culture tend to frame it as learned behaviour (Knudson, 1978: 85-87; Kessing, 1981: 68; Monaghan and Just, 2000: 35; Byrne, 2008: 150; Layton, 2008: 264; Gamble, 2015: 71; Kronenfeld, 2017: 4-8). Learning may be through observation or participation within activities, resulting in patterns of behaviour which are shared by an entire group and transmitted to new members as they grow up (ibid.). The behaviours that make up culture are sometimes framed as a non-biological adaptations to the environment (Stewart, 1955; White, 1959; Kudson, 1978: 86; Fagan, 1991: 70, 527; Gamble, 2015: 72), and indeed create a new context to which people must adapt (Knudson, 1978: 86). These ideas have been continued more recently with the concept of memes, which are discussed more in Chapter 5 in relation to mechanisms for perceptual variance between populations.

It is certainly the case that at the larger scale culture is typically shared by a linguistically and geographically related group of people (Knudson, 1978: 85), suggesting that adaptation to local conditions may drive cultural variance (although the rise of international communication means that this may no longer be the case for certain sub-cultures). Each person in fact participates in multiple, mixing cultures, and may even have their own individual version of
their collective culture(s) (Fagan, 1991: 71; Kronenfeld, 2017: 5, 9). Each of these subcultures fit within a hierarchy of cultures that end at the macro level. Macro culture is the highest level of culture that one might recognise, for example western culture (Kronenfeld, 2017: 4). The culture that psychologists and archaeologists talk about affecting perception is at, or near, this macro level, with linguistically and geographically related people. It is the societal level differences that they argue affect the development of a child, and shapes their experience at the broadest level.

Much of the description so far has suggested that whilst culture may not be passive, as individuals, its constituents are. Communication within sub-cultures, and the nesting of cultures indicates that this isn’t the case. Instead people are active modifiers of their own cultures, reshaping it, even as they live within it, through their interactions with others within that culture, and indeed other cultures around them (Byrne, 2008: 151, 162; Ingold, 2002: 330). Monaghan and Just (2000: 39) compare this to a coral reef, where the reef itself is built and reshaped by many individual animals, but it constrains them by its pre-existing form and will outlast each of them. The shape of culture has a weight to it which guides new developments and which may be difficult to overcome. One might see the various elements of culture and the individual behaviours of the people within it as a series of overlapping bell curves. There will be many differences between people and sub groups within a culture, but anything which lies too far from the centre of mass of the various elements is unlikely to be successful within that culture, at least under normal circumstances. This continual guide means that culture is also common experience, in that individuals from within the same culture will have had, broadly speaking, many of the same experiences throughout their life.

The final common way in which culture is defined is as the meaning and symbolic conceptualisation people project onto the world (Geertz, 1975: 5; Monaghan and Just, 2000: 34; Kronenfeld, 2017: 4). Each culture therefore varies through a different understanding of the world. It would seem that most of the definitions of culture fall more within Ingold’s (2002) phenomenological approach to anthropology, rather than the cognitivist approach, but these conceptions can overlap. Culture can still be learned behaviour whilst allowing for cognitive learning, for example, contrary to what Kronenfeld (2017) states. Some elements of culture are complex, or non-physical and require explicit teaching, such as stories or musical
theories, whilst others can be learnt through observation. There are in fact elements of the
cognitive and the phenomenological within each definition.

It is also apparent that although culture is defined in a number of different ways in
anthropological and archaeological literature, generally they do not contradict each other,
but rather, overlap. Indeed each of the proponents of these ideas suggest more than one
definition. Perhaps culture is not beyond definition as Ingold (2002) suggests, but it is beyond
narrow definition. Culture then is non-biological, ever evolving, shared history, potential
knowledge base, patterns of behaviour and a rule set which shapes peoples’ choices and
actions. It is also the stuff that those people create and the impact they have upon each other
and the world around them. Quite simply culture is our social and cognitive frame of
reference and both the context in which we act and the result of those actions.

It is also important to make clear that whilst culture and nature could be seen as distinct,
they need not be diametrically opposed. Culture and nature influence each other, with our
culture emerging from our biology and our interaction with the environment as much as social
interactions. Culture in turn influences the environment, and even our biology. As is discussed
in Chapter 5, this complicates the issue of cultural effects on perception, but it is clear that in
all of the literature surrounding this issue, culture is meant as the non-biological variation
between different groups of people. Ultimately, even if one rejects the notion of
distinguishing between culture and nature, there still exists the assertion that different
groups perceive the world differently, and not through biological difference.

1.5 Environment, Context, Experience and Presentation

The words ‘environment’, ‘context’ and ‘experience’ are also used throughout this thesis and
appear in both archaeological and perceptual work. Given the potential for confusion and
conflation it is also worth giving definitions of these terms. The word interpretation is also be
used in multiple ways in archaeological literature, and so is worth defining for this thesis.

Environment can be defined as everything physical within the area being described. The
environment therefore consists of landscape, animals, people, plants, objects, weather etc. It
is a broader term than landscape, having no temporal or mobility constraints for its
constituent parts. Much like landscape, the environment is generally considered to be a
bounded space, even if that boundary is equally ill defined. It is usually referenced in terms of an individual or group, though sometimes a more universal reference to "the environment" might be made. Importantly the environment is perceivable, there are no aspects of it which exist only in consciousness.

If environment is one step up from landscape, context is the next. This is not referring to an *archaeological context*, but *wider context*. Context builds upon the elements of landscape and environment, and also brings in those things that only exist within and between people; culture, relationships, power structure, thoughts, meaning etc. It is context that holds all of the additional layers that humanistic approaches to landscape look to incorporate, and whilst it is built upon the act of perception of the environment, it is not something physically sensable, only its effects are. Therefore, there is a complex interaction between context and the environment (and landscape as a feature of it) where each affects the other simultaneously.

Throughout this thesis I will refer to perception of the landscape, but also to perception of the environment in general, since this has been the focus of much perceptual work. The idea of context will be explored less, though it will come up on occasion, as this thesis is primarily concerned with visual perception. Whilst the physical effects and products of context are visible, this is through the environment; the context itself is built on higher-order cognitive processes. One way to think about this archaeologically is that environment forms the basis of the archaeological record, whilst context is what we try to gain access to through our interpretation of that record.

Experience is to perception as context is to environment. In this sense experience is the higher order aspects of our interaction with the world. Experience may also refer to one’s past and the experience they have gained or the experiences they have had. For the purpose of this thesis then, experience does not directly equate to perception. Where necessary for readability the phrase “*perceptual experience*” may be used; the prefix of perceptual indicates that perception and not wider experience is being discussed.

The word interpretation is often used to refer to disseminating information to members of the public, for example in ‘interpretation panels’. This could generate some confusion
however, since interpretation in the sense of assessing archaeological data is referred to throughout this thesis. It is therefore best to use separate terms, and the word presentation will be used to refer to the dissemination of information to the public at sites and museums.

1.6 What Constitutes Visuo-Spatial Data in a Landscape Context?

For those unfamiliar with the term, it is also important to define what is meant by visuo-spatial. Landscape archaeology takes many forms, but a key element of much work is the identification of spatial attributes and relationships within the landscape. Spatial attributes are those such as size, location, orientation etc. They all refer to individual landscape features and can be objectively defined. They can also include things such as steepness of gradient, altitude, the presence of water in various forms and ruggedness.

Spatial relationships are emergent properties that manifest themselves in the interaction of attributes of different landscape elements. Examples of such relationships include distances or alignments between features, the extent of clustering or dispersal and intersection. They can also involve topographic location, i.e. the position of a feature in relation to the surrounding landforms, which might include placement on the top of a hill, close to a river, on a false crest or on flat ground. Position relative to vegetation, such as woodland, or relative to the movements of the sun also constitute spatial relationships. The latter may be as simple as being on a slope that faces sunrise or sunset, or it may be a more complex relationship that emerges out of the sun’s position and the alignment of multiple features.

These attributes and relationships all have impacts on how a landscape may be experienced through our senses. Many of them may potentially be perceived through a range of senses or through proprioception, however, the predominant way of perceiving many of these spatial attributes/relationships is through vision.

In addition, there are certain spatial attributes/relationships which are manifest only through vision. The horizon is an attribute of the landscape that shifts; it emerges from the relationship between topography and a viewer. Whilst it shifts, the rate at which it changes depends on the topography and the position of the viewer in relation to it. Walking along the lowest or highest points in a landscape with varied elevation will often introduce relatively small changes in the horizon, whereas transitioning between elevations can introduce rapid
changes. The positioning of landscape features, such as monuments, in relation to the horizon is therefore highly dependent on the viewer’s location and the topography, but it is a spatial relationship that only manifests itself visually. Equally the idea of something being framed against the sky emerges out of vision and the relationship between topography and the viewer’s location, though not always in tandem with the horizon more generally. Such a relationship can often be more spatially variable. Each of these attributes and relationships is primarily, or solely, perceived through the use of vision. They therefore constitute visuo-spatial relationships.

1.7 Archaeological Approaches to the Perception of Landscape

As noted at the start of this chapter, visuo-spatial approaches to archaeological landscapes have been a primary method of archaeological investigation throughout its history. However, the way in which this work has been conceived and theoretically justified has varied extensively. How archaeologists treat perception of the landscape and any cross-cultural variation, is a key foundation in supporting arguments they make about the intent and meaning behind landscape features.

The earliest instances of landscape archaeology could be seen as quite theoretically basic; they adopted a stance of naïve empiricism, the idea that the data we gather will speak for itself in an unproblematic and objective manner. Landscape archaeology studies failed to consider the possibility, or the implications, of the author’s perception differing from the people of the past (for example Aston and Rowley, 1974). Johnson (2011a; 2011b) believes that whilst the intellectual steam of naïve empiricism ran out a long time ago, it is still common in archaeology in an implicit and untheorised way, even within studies that go beyond basic what, how and where questions.

Processual archaeology brought a critical approach to archaeology and the understanding that interpreting the past required not just more data, but principles for determining the relevance of that data (Binford, 1972). This led to the development of middle range theory, in order to create a bridge of inference between data and past behaviour (Gamble, 2015: 87). However, this still relied on data from modern societies and so does not resolve the problems of paleopsychology which archaeology faces.
The recognition that data could not be taken at face value was nonetheless very important. The reaction of some, such as Hoskins, Aston and Rowley, was to argue that only those with the right eye and mind can understand landscapes (Aston and Rowley, 1974: 14; Johnson, 2007: 48), whilst others emphasised the need to learn the appropriate way to “read the landscape” (Rippon, 2004: 5). These approaches also fail to address the issue of perceptual variation between past and modern people, and could be criticised for restricting archaeological insight to a select few.

Post-processual archaeology generated further critiques of archaeological practice, resulting in questions of data validity and perceptual variation between cultures being raised for the first time and critically engaged with (Bender, 1993; Thomas, 1996; Hirsch, 1995). Many arguments provided no evidence, however, and some archaeologists simply dismissed the issue. Thomas (2001: 180), for example, argued that the allegory of present understanding standing for past meaning is enough. Many post-processualists argued that we cannot interpret landscapes appropriately, since they are viewed differently by people depending on how they interact with the landscape (Johnson, 2010: 107). Meanwhile Kealhofer (1999: 61) argued that whilst landscape shapes the actions of those in it, it can still be perceived differently by different individuals or groups.

Shanks and Tilley (1992: 8) took this further, noting that “[t]he present’s relation to the past is no longer self-evident. Past and present are separated by a chasm of misunderstanding.” For them, archaeological narrative can never be restricted to how people in the past saw their world, it necessarily includes the perspectives of the modern researcher (ibid.: 19). This leaves us with an archaeology which creates a past within a present, both of which are constantly reinterpreted (ibid.: 20-22, 104). At this time, this is an overly pessimistic view, however; whilst the influence of the researchers perspective is an undeniable factor in all archaeological research, only if we can know to what extent the perspectives of the modern researcher may be distorting the narrative can we determine how valid our hypotheses about the past are.

One of the biggest criticisms of post-processual approaches to landscape is their subjectivity. Kytmannow (2008) and Flemming (2005) argue that personal impressions are presented as evidence, points are over-laboured and that identical relationships can be presented with different meanings. Both are particularly critical of Cummings and Whittle’s (2004) work on
tombs in Wales, for example. With such approaches, the amount of data collected has no relation to the accuracy of the interpretation, since there is no apparent causal link between evidence and interpretation. Thus Kytnmannow (2008: 33) asks whether we learn about anything except the impressions of the author through such approaches. Llobera (2001) voiced similar criticisms and noted the need to understand psychological research and how perception may have changed through time. He suggested Topographic Prominence as an alternative way to study past landscapes, though made no mention of how this might have been relevant to past people (ibid.). In a critique of such GIS based approaches to landscape, Baldwin et al. (1996) questioned the possibility to model modern cognition of the landscape through the tools utilised, let alone that of past people.

One of the few works that has aimed to demonstrate just how problematic assuming common perception is comes from Smith and Blundell (2004). They show that evidence based interpretations may well be plausible and yet still completely wrong, due to a lack of knowledge of the beliefs and practices of past people, and our own culturally affected perceptions (Smith and Blundell, 2004: 257-259). For them, this is a problem which no framework will allow us to break out of (ibid.: 254).

Other approaches have argued for unified perception across different cultures. Taking inspiration from Phenomenological works, (which are examined more in Chapter 2), Tilley (2004: 31) states that our engagement with the landscape is shared, regardless of culture, since it deals with a “prereflective embodied consciousness, that is necessarily anonymous and which all humans share prior to and irrespective of the distinctive cultural and linguistic worlds in which they are enmeshed”. Meanwhile, Van Dyke (2003) uses phenomenological premises to reconstruct past “senses of place” and “social memories” from spatial relationships. Others like Hamilakis (2014: 10) simply state that perception is universal and cross-cultural, without any justification. Whilst such stances certainly aim to remove the problem, they cannot be given credence, since they do not offer clear evidence as to why it should be the case. Cognitive archaeologists have taken this further, arguing that since there is no significant difference in the DNA of past and present people there is no reason to assert that differences in mental processes exist (Renfrew, 1994; 2005). Of course the issue at hand for most commentators on this topic is not biological, but the effect of cultural variation on perception.
This debate about the influence of biology and culture on human development is of course nothing new and applies to many areas of study. As will be demonstrated in Chapter 2 and 3 there are a variety of views about perception's place in this debate. Renfrew's (1994) assertion can be seen as in line with Clark's (1989) concept of *gradualistic holism*, the idea that evolutionary history has a greater impact on the function of an organism than current constraints. In contrast Kristiansen argued that culture had replaced biology as the main influence on human development (Bintliff and Pearce, 2011: 16) and Malafouris (2013: 42) has emphasized the importance of gene-environment interaction affecting genetic expression.

The interest in perception lead Johnston (1998) to discuss different conceptions of it, including from psychological research, but his overview was very limited and presented a skewed view of perceptual possibilities, thus doing little to further understanding of cross-cultural perception. Giles (2007: 106) has noted that whilst other disciplines have had debates about the historicity of visuality and spatiality, many archaeological approaches still use modern perception to understand the experience of past people. Even during, or shortly after, the period when debates about cultural variance in perception were in vogue, some landscape studies failed to engage with the topic and continued with naïve empiricist approaches. Examples include: Nash’s (1997) analysis of chambered tombs in Wales; Pollard and Reynolds’ (2002) description of Avebury; Van Dyke’s (2003) examination of Chacoan great houses; and Eagles and Field’s (2004) examination of long barrows along the River Wylye. Watson’s (2004) examination of henge architecture and their environments, edged close to the issue, but did not engage directly, whilst Gillings and Pollard (2004) argue that there was never only one interpretation of Avebury, but continue to discuss visuo-spatial attributes and relationships without reference to any inherent problem in data collection.

There are still a large number of landscape studies making use of visuo-spatial approaches; recent examples which do not make reference to perception or previous debates about it include work by Brophy and Millican (2015), Contreras (2015), Jones et al. (2015), Llobera (2015), Scarre (2015), Flores (2017) and Monteith (2017). There is therefore a view by some archaeologists that things have moved on, and that the issue of data validity which cultural variation in perception raises is no longer a concern (J. Pollard pers. comm.). This may be
because of a lack of awareness, or an implicit assumption of the appropriateness of empiricist or relativist approaches. However, there are still some landscape archaeologists bringing attention to cultural variation in perception, even if they are less engaged with the debate. Examples include: Hu (2012) arguing that archaeologists need a greater understanding of psychological research to address such issues; Skeates (2010) noting that despite the importance of the senses, archaeologists have generally neglected them in their study; Thomas (2012), who assumes a pre-determined division between western/modern and non-western/past societies; Eve (2014), who, drawing on phenomenology, argues that we cannot have the same experience as someone from a past society; and Springs (2015), who states that how landscapes are perceived is a product of culture.

Whilst the specific issue of this thesis is no longer widely discussed itself, the broader issue of potential bias in archaeological interpretation is still a topic of much discussion. This demonstrates that archaeological epistemology is still a theoretically relevant topic. Nicholas and Markey (2015) note that the subject of archaeological research can never be observed directly, yet archaeology is committed to the premise that aspects of the past are knowable. This raises two unavoidable questions; how do we know what we do about the archaeological record, and what type of evidence can serve as proof for our interpretations (ibid.: 287)? Meanwhile Lucas (2015) has tried to understand the limits of archaeological interpretation through an examination of the archaeological record as apprehended by archaeologists, and Shillito (2017) has argued that we can only understand our data if we fully understand how it has been produced. Bell (2015: 45) has echoed Johnson’s (2007) assertion that a lot of archaeology finds its basis in an empirical approach to observation, assuming that objectivity can be achieved without obfuscation by “pre-understandings”. For Bell (2015) empiricism is not a flawed approach, but he believes that archaeologists have put insufficient work into honing empirical skills because of the philosophically problematic nature of objectivity. In order to overcome this, he encourages the use of tightly controlled hypothesis driven experimentation (Bell, 2015). Danckers (2017: 211) echoes these ideas, criticising most archaeological practice for not engaging explicitly with an epistemological analysis of its theoretical and methodological background. In addition, Murray and Spriggs (2017) have discussed the historicity of scientific knowledge, critiquing the lack of self-reflection in archaeology which leads to an assumption of validity in current practice.
There is clearly still a concern with the epistemological basis of archaeological practice, and some awareness of the need to understand cultural variation in perception. However, even when engaging with the issue of perceptual variation, or noting the need for a better understanding of psychological research, there has been then a lack of critical engagement with perceptual studies within archaeology. Zubrow (1994: 110) attempted to resolve the question of cross-cultural perceptual variation by positing a number of universal cognitive principles which exist in all peoples at all times; these are inclusion, bisection, contiguity, contingency, equality and temporality (ibid.). However, he offered no justification as to why universal principles should exist, nor why these principles in particular. Johnston (1998) failed to reflect the variety of perceptual research and Giles (2007) drew on work from art and architectural history which treated vision itself as unvaried. More recently, Eve (2014) considered a selection of work on the philosophy of mind, rather than psychological work which makes use of experimental findings. Thomas (2015a) meanwhile argues that anthropological research in perception suggests the possibility that not only do we perceive the world differently, but that we actually inhabit different material worlds. Of course such a view is not practically useful; if we are to understand anything about the real world there must be a single reality. Whilst I do not wish to privilege a Western scientific world view over and above other conceptions of the world, it is undeniable that scientific practice demonstrably works, and as will be discussed in relation to Sense-Datum Theory, shows that there is a real world with genuine attributes.

One archaeologist who has engaged with perceptual research through the range of philosophical, psychological and neurological approaches is Dobrez (2013), however this is in the context of rock art, not landscapes. Despite this, he notes some similar problems, with archaeologists conflating and confusing the idea that perception is different between modern and past people, with the understanding of meaning being different (ibid).

This lack of extensive, critical engagement with perceptual research means that the issue of cross-cultural variation in perception has never been resolved in archaeology, despite the continued use of visuo-spatial approaches to landscape in seeking to understand past people. If the question of data validity in landscape archaeology, as raised by the possibility of cultural variation in visual perception, is such an important issue for archaeological epistemology one
may well ask why this is the case. One reason may simply be that such concerns do not form part of the current theoretical vogue. Gardner and Cochrane (2011: 12) believe that significant theoretical problems are not being worked through, due to a lack of sustained and constructive engagement in the theoretical environment. Instead “archaeological theorists… move overrapidly [sic] from one half-baked set of borrowed ideas to the next” (ibid.). A valorisation of the new, over sustained engagement with established theory, means that archaeologists try to keep up with the current fashion (Bintliff, 2011; Pluciennik, 2011), and Bintliff and Pearce (2011) have argued that this is driven primarily by changes in wider trends of western thought. This lack of engagement could also be seen as a symptom of the *Peace Dividend* (Gamble, 2015: 26; Abadía, 2017). This is the idea that in the current research environment, archaeologists do not question the theoretical stance taken in another’s work, focussing just on the results. Further reasons for the lack of recent engagement with perceptual issues may be a lack of awareness in a new generation of archaeologists, a resignation that the issue will never be solved or a “don’t ask, don’t tell” mentality that seeks to avoid having to deal with difficult issues.

Whatever the case, whilst cross-cultural variation in perception is no longer a fashionable topic, it is evidently important to understand, and a growing body of literature suggests that science progresses through self-critical awareness and the discarding of false knowledge, more than through the mere accumulation of data (Abadía, 2017). Whilst landscape is the focus of this thesis, the question of past people’s perception in fact affects all archaeological discourse that seeks to understand past people, it being primarily an epistemologically realist enterprise, seeking to use the senses to learn things about the traces of the past available to us in the present. Even relatively atheoretical approaches such as statistical analyses assume much about how past peoples saw the world. For example, there is no guarantee, even if a large proportion of particular sites are at high altitudes, that the culture that built them paid any attention to or even registered this fact; they may simply have not looked at the landscape in this way. Only approaches which focus solely on the accumulation of facts and the description of processes, rather than engaging with the thoughts, beliefs and intentions of past people, can really be said to be free of this perceptual concern. It is therefore important that research into visual perception is critically assessed, so that an understanding of the effect of culture on visual perception of the landscape can be gained.
1.8 The Audience in Site Presentation

The previous section outlined the potential for cross-cultural variation in visual perception to affect our interpretations of the past. Whilst this is an important consideration in archaeological research, it also has implications for our presentation of archaeology to the public at archaeological sites and landscapes. Archaeologists can only present interpretations which are as accurate as those they are able to make, but perhaps more important for presentation is the reception of those interpretations. Regardless of whether the interpretations we present are accurate reflections of the past, it is important that the public are able to engage with them.

Archaeologists have a duty to the public to present the past in a way that educates and engages them, and to involve them in its management (Mckercher and du Cros, 2002; Liwieratos, 2009; Chan, 2017). This duty is recognised by public bodies such as the Heritage Lottery Fund (2010) and Historic England (2017), forming key elements of the latter’s research agenda. In the USA, the Visitor Services Association have even gone as far as to create a ‘Visitor’s Bill of Rights’ (Black, 2005: 32). A big factor in succeeding with this duty is site presentation (Hughes et al., 2013). Much of the work discussed in this section relates to museum practices, but it is equally applicable to site/landscape presentation.

If there is a cultural difference in visual perception, then it is entirely possible that the landscape interpretations presented at archaeological sites will not match the perception of some visitor groups. The visuo-spatial observations made by local archaeologists which underlie those interpretations may not be perceptible by some visitors, meaning that they will not be able to understand and engage with the interpretation presented. The issue of perceptual differences has been hinted at by a number of authors (Merriman, 1999b; Owen, 1999; Sørensen, 1999; Wood and Cotton, 1999; Hooper-Greenhill, 2000; Aplin, 2002), but it has not been as widely explored as in the field of landscape interpretation. James (1999) and Liwieratos (2009) are two examples who are more explicit in their discussion of perceptual variance. James (1999), in discussing reconstructions, argues against the wide held assumption that reading pictures is a universal process, suggesting that this may be culturally specific. One example he gives to support his argument is evidence that some non-European cultures are not able to ‘read’ photographs (ibid). These two issues will be examined in
Chapter 3, as they form part of the body of cross-cultural perception work. Liwieratos (2009: 37) meanwhile, asserts that landscape perception is culturally constructed but, as with the studies discussed in the previous section, offers no evidence to support such an assertion.

This recognition that there are alternative ways to interpret the past, and that this may be determined by ones background, is not always reflected in museum practice, though since the 1960’s there have been increasing efforts to make museums more inclusive (Merriman, 1999a; 1999b; Labadi, 2018). Where this does not occur, presentations tend to focus on the views of the dominant local culture, not only diminishing the role of other cultures in the past, but also potentially excluding those who are not part of the dominant culture from full engagement with the presentation (ibid.). Such approaches also tend to imply an objectivity (Merriman, 1999b) which, as shown above, has been hotly contested.

The recognition of archaeologists’ duty to the public, and the need to be more inclusive, has led to a commitment to increase engagement from Black and ethnic minority groups in particular (Kaufman, 2004; Crooke, 2007; National Audit Office, 2009; Rahim and Navra, 2013; Historic England, 2017; Phillips, 2018). Beyond initiatives aimed at advertising visiting heritage sites, there is also a need to critically assess how we present information to these groups, and indeed other, non-resident groups. Good presentation adds value to the visitor experience, but it must focus on the most interesting and notable features, explain their significance (Alpin, 2002: 35), and involve sensory perception, not just text (Black, 2005: 183-185). If the elements focussed on within the presentation do not match the visual perception of a visitor then this could detract from that experience. Swain (2007) and Matero (2010) note that there are a range of problems for both museum and site presentation which must be overcome for diverse engagement, but the vital first step is understanding the audience; visitors are no longer considered to be passive receivers of information, but active participants in the presentation process (Merriman, 1999b: 623).

The need to understand audiences, and that there are differences amongst them, is widely recognised (see for example Edson and Dean, 1994; Jameson 1999; Alpin, 2002; Mckercher and du Cros, 2002; Howard, 2003; Kreps, 2003; Black, 2005; Okpoko and Okonkw, 2005; Heritage Lottery Fund, 2010; Hughes et al., 2013; Historic England, 2017). This understanding is generally acquired through market research looking at demographic groups and how they
respond to exhibits (Merriman, 1999b; Aplin 2002; Black, 2005), and has been used at Avebury to refine and target presentation of the site and wider landscape (Taylor, 2004). Common demographic factors assessed are age, gender, education, class, language and ethnic origin (Alpin, 2003: 39-40; Black 2005: 10-11). Most of the market research focuses on motivations for visits, topics covered, values presented or specific meaning assigned to objects, rather than perceptual differences and their effect on interpretation. For landscape presentation it is important that we understand the basic elements of landscape interpretation, and if we can understand cultural differences in visual perception, it will inform how best to present archaeological landscapes for different groups.

In recognition of these potential differences, some advocate the presentation of multiple possible interpretations, or the presentation of the views of particular stakeholder groups. As well as potentially increasing engagement from diverse groups (Jameson, 1999), presenting multiple possible interpretations avoids presenting one strand of information as the only pertinent aspect of a site/landscape/collection, and increases the possibility of future epistemic developments (Howard, 2003). Multiple interpretations allow visitors to select those which they can identify with and to engage more critically with the archaeological record (Roberts, 1997; Carver, 2004; Frodsham, 2004; Labadi, 2018). Waddington stresses that whilst this is important, the work still needs to be based in fact in order to avoid an extreme relativist position (Waddington, 2004: 50). The avoidance of such extreme relativism is another reason why it is important to identify and quantify the perceptual differences between different cultures; it gives archaeologists a possibility space within which to work.

Certain museums have attempted to directly engage minority/indigenous groups in the presentation of their history in order to avoid a western biased presentation, whilst other museums have been specifically created by those groups to present their history (Ardren, 2017; Car-Locke and Nicholas, 2017; Levy, 2017; Labadi; 2018). Of particular interest is Labadi’s (2018) work on immigrants; the number of immigrants and refugees within European countries has been rising in recent years due to global political events, if they are to fully engage with their new society they must feel welcome in all of its institutions, including heritage ones. There have been attempts in recent years to involve immigrants in projects at the Manchester Museum and the National Gallery of Denmark, and a number of immigration
museums have emerged to reflect the role of immigrants and the demographic changes countries have undergone (*ibid.*).

These multi-vocal approaches do not solve all interpretive and presentation problems. There is still a question about what to present; the views of minority/indigenous groups can be incorporated, but just as our culture has changed from that in the past, so too will have theirs. There is therefore no guarantee that their interpretations are any more valid. Their views must of course be respected, it is their heritage, but if culture does affect visual perception, then interpretations built upon that perception will be different in a modern context. Additionally, many presentations which do incorporate minority groups in their development focus primarily on reflecting their history back at them, rather than addressing how to present wider heritage. This implies that minority groups are, or should be, only interested in their own heritage, and that their engagement with the rest of the heritage corpus need not be considered. If visual perception, and indeed the higher order needs discussed in museum literature, are culturally dependent, then such an approach is highly problematic, and only furthers the isolation of these minority/indigenous groups, rather than increasing their overall integration and engagement. In contrast, as the majority of museum staff will be from the dominant culture, it will have an impact upon the presentation of minority groups’ heritage. There have also been issues with exhibitions, such as the Manchester Museum Lindow Man exhibition, which have presented multiple interpretations; visitors had a desire to know which interpretation was correct and rejected the multivocal approach (Labadi, 2018: 135). Indeed some have argued that it can be better to present a single authoritative interpretation to the public (Merriman, 1999b: 626; Mckercher and du Cros, 2002: 36; Stone, 2004: 115).

Unless it can be shown that cultural variation is not an issue, that archaeological interpretation has solid foundations, and an interpretation is (at least currently) without doubt correct, such unequivocal presentation is problematic. A better way to alleviate the potential problems of multiple presentation would be greater honesty with the public about the uncertainties within the interpretive process (Buckley, 1999: 44; Jameson, 1999: 597; Merriman, 1999b: 620; Frodsham, 2004: 10).

Beyond the idea that archaeologists have a duty to the public, there are serious practical reasons for presenting interpretations which the public can engage with. Heritage sites have
a non-captive audience (Mckercher and du Cros, 2002; Carver 2004); this means that they can choose not to engage, resulting in a drop in visitor numbers and therefore revenue. In recent years, museum visitor numbers have been dropping in Western Europe, and Labadi (2018: 129) believes that this may be because they are considered less relevant in these increasingly diverse societies. This is a source of concern, as heritage jobs and the continued management of heritage sites are directly dependent upon an engaged public that see heritage as valuable (Mckercher and du Cros, 2004; Carver, 2004; Frodsham, 2004; Heritage Lottery Fund, 2010). More seriously for wider society, heritage can be a source of potential conflict; presentations which are at odds with certain groups’ perception, values or beliefs can cause serious issues (Roberts, 1997; Howard, 2003; del la Tore, 2005; Crooke, 2007; Wallace and Hannam, 2013). Positive engagement meanwhile leads to increased cohesion and heritage protection (Carver, 2004; Heritage Lottery Fund; 2010; Car-Locke and Nicholas, 2017).

Whilst the majority of more recent literature on presentation emphasises the potential for difference, as discussed above, it is important to note that this is not a universal view. Duke (2007: 61) and Hughes et al. (2013: 76) argue that the public almost never fully engage with heritage, and thus take whatever is presented to them at face value. If this is the case then the potential issues regarding engagement and conflict cease to be such a problem, however, this is definitely a minority view.

As well as having direct implications for presentation, cross-cultural variance in visual perception also has implications for CRM. It is recognised that indigenous groups should be involved in the management of their heritage (Kreps, 2003: 153; Okpoko and Okonkw, 2005; Ardren, 2017; Car-Locke and Nicholas, 2017), and the views of the wider public are also sometimes considered (Historic Scotland, 2000; del la Torre, 2005). A key factor in CRM is the identification of significance; this determines what elements of a site/landscape are preserved and how they are managed (Historic Scotland, 2000; del la Torre, 2005; Liweratos, 2009). This significance is built upon particular features, relationships, context and values (del la Torre, 2005; Liweratos, 2009). Some of the factors considered in the significance of sites/landscapes are therefore visuo-spatial relationships and interpretations built upon them, and so there is a direct link between visual perception and the identification of significance. By extension, there is a link between visual perception and the
management/preservation strategies of archaeological sites. If visual perception varies by culture, then so too will the assessment of significance. The managing archaeologists and consulted public may therefore identify different significant factors than other public groups, and the past people that inhabited the site/landscape. Ultimately, management affects both interpretation and presentation (Matero, 2010), reinforcing the problem of differing visual perception between archaeologists and the public/past people. This also limits the possibility for new epistemological developments, as features which were significant to past people may not be preserved or properly managed.

This section has demonstrated the importance of understanding modern variation in visual perception as well as past variation. Regardless of whether the presentation is an accurate reflection of the past, it is important that the public can engage with it. If this does not occur, it is a failure on heritage professionals’ part to understand their audience and what they need, and to respond to it appropriately. Such a situation is bad for both heritage and the public. Perceptual variation could also have consequences for the long term management of heritage and therefore the future potential for interpretation. The research question, “To what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?” is therefore an important consideration for interpretive archaeology and archaeological presentation, the understanding of modern cultures’ visual perception being a key starting point.

1.9 Perceptual Research and Ocularcentrism

Much of archaeological study is done visually, be it identification of artefacts and their taphonomy, analysis of bones, or the examination of cave art and styles of decoration. Landscape archaeology has been particularly dominated by visual approaches, but in the last fifteen years there has been a reaction by many archaeologists against the study of vision. It is therefore necessary to justify this research’s focus on visual perception to the exclusion of other modalities.

Archaeology has been accused of being ocularcentric, privileging vision over the other senses (Hamilakis, 2011). Some critics, like Thomas (1993), employ feminist ideas such as the ‘male gaze’ to portray vision as a gendered, ethnocentric sense, the study and use of which
distances, objectifies and privileges the perspective of the western white male. Others such as Hamilakis (2011) argue that the vocabulary employed by archaeology clearly demonstrates its visual bias; this creates a tension between the discipline on the one hand, and our own multi-sensory perceptual experience of the archaeological record on the other. He also states that vision has not been a homogenous sensory modality throughout history, giving the example of how vision was theorised by the philosophers of antiquity as extramission (Hamilakis, 2011: 210).

A number of aspects of archaeological study have been critiqued for their use of vision, but landscape studies are particularly targeted, especially those that make use of maps and GIS for spatial analysis. Frieman and Gillings (2007), for example, argue that these approaches treat vision as representative of perception as a whole, neglecting other senses. Others state that these approaches create abstracted, often top down views of the world, which past people would not recognise (Thomas, 1993). Goldhahn (2002) has further critiqued the way in which vision can be used for interpretation, arguing that even amongst archaeological researchers there is little chance of agreement. The implication is that archaeological practice will likely fail to find interpretations that would make sense to the people of the past; indeed Frieman and Gillings (2007: 9) argue that the way we structure our sensory modalities is as much culturally constituted as natural.

The result of these critiques is that few would now question the validity of researching archaeologies of sound, touch, taste or smell, but vision has become something of a dirty word and its study is something which must be justified. However, many of these critiques of visual research are problematic. In contrast to the likes of Thomas (1993), Ingold (2000) has argued that vision is not in fact an objectifying, exploitative sense. He asserts that this concept comes from looking at objects, and is clearly inadequate when considering looking into the eyes of another person (ibid.). For Ingold (2000: 286), these false conceptions come from presupposing how we view the world rather than questioning actual lived experience.

Ingold (2000) rejects the common view that vision is distancing and sets you against the world, whilst hearing incorporates it, and instead believes that vision and hearing are in fact very similar. He gives the example of echolocation, which allows hearing to be used for spatial location and depends on the movement of the individual (ibid.). Whilst this is certainly true,
echolocation plays a much smaller role for normal sighted individuals, and few people are truly proficient in it; in actual fact, blindness can have detrimental effects on spatial hearing (Zwiers, Van Opstal and Cruysberg, 2001; Abel et al., 2002). Additionally, sound is usually received from all around the environment without action (though action can influence it), while vision is based upon active engagement (Nöe, 2004). Ingold (2000: 277) even states himself that it is usually through incorporating vision into the act of hearing that turns it from something passive into active listening. Ingold (2000: 272) also describes an individual who turned blind as an adult and found that not being able to see people resulted in a feeling of distance and withdrawal; for him, vision personified whilst sound objectified. The idea that vision creates distance from and objectifies the world could therefore be seen as incorrect. To see we must actively engage with the world (Nöe, 2004), and engagement precludes distance.

One might also challenge Thomas’ (1993) assertion that vision privileges the perspective of the western white male. Visual perception exists across gender and race boundaries, and so it makes little sense to assert that presenting information visually privileges the experience of one group. One might assert that different groups place different social value on certain senses, but they have equal capacity to experience, and utility for, all the senses. Thomas’ (1993) critique comes from what is presented to be perceived and how perception is manipulated, restricted or emphasised. This is clearly heavily value laden and could be seen, in certain contexts, as privileging the western white male. The actual act of perception itself does not have the same baggage. This becomes more complicated when considering perceptual disability of course; a visually impaired person’s perceptual experience of landscape is very different. This would be an important line of enquiry, but one that deserves its own study rather than being briefly considered in this thesis.

Wheatley (2014: 120) and Llobera (2007) believe that critiques of visual analyses akin to that by Frieman and Gillings (2007) are little more than straw men; the analyses they discuss do not claim that vision is a proxy for perception as a whole, but openly state that they deal with just one part of the sensorium. Vision is the focus because they find evidence of visual structure, or believe vision to be more amenable to formal landscape analysis than the other senses (Wheatley, 2014: 120). Wheatley (2014) argues that visual structure is a useful concept
because it separates the empirical documentation of patterns from the process of forming
hypotheses; we must show that patterns exist before we can interpret them, and spatial
analyses are necessary for this. Whether these patterns had any meaning or were deliberate
creations is undoubtedly a theoretical issue, but equally no data collection is truly atheoretical
(Hodder, 2000a: 5; Hamilton, 2011: 266). However, so long as it clear that their identification
makes no claims about the past until corroborated, and it does not exclude the collection of
other data, this approach holds value.

The argument that the top down views used in many landscape studies would have been
completely alien to many of the people we study (Thomas, 1993) is also potentially
problematic. The array of evidence for historic mapping and the existence of geoglyphs
around the world suggest that abstracting to an aerial view was not beyond past people
(Harley and Woodward, 1987a; Black, 1997; Lewis, 1998; Arcà, 2000; Fossati, 2002; Harrell,
2008; Utrilla et al., 2009; Mailland, 2012; Ruggles and Saunders, 2012; Clarkson, 2014). A
review of these topics will be given in Chapter 4.

Frieman and Gillings (2007) do not support their insistence that the division of sensory
modalities is culturally constituted with any scientific studies of cross-cultural perception.
Given that different parts of the brain are stimulated by different sensory information (Farah,
2000), it seems their claim may be unlikely. Instead, it may be that, in terms of inter-cultural
variation at least, it is the cultural understanding of the senses, rather than the actual division
of sensory perception itself, which varies. This does not preclude intra-cultural or inter-
cultural variation which, if it exists, is likely distributed along a bell curve of possibilities.

Hamilakis’ (2011: 210) assertion that other peoples have theorised vision differently is
evidently misleading; the way we theorise vision bears no relation to how we actually
perceive. If this were not true, then each of us that adhered to a different perceptual theory
would perceive differently, the ancient Greeks would have emitted light from their eyes, and
all research into vision would be biased by participants and those running it. Theories are
simply attempts to explain what is known, they do not form reality. In addition, it is sometimes
asserted that vision’s place at the top of a hierarchy of senses is a relatively modern
conception (Hamilakis, 2011), however, historic writings about the senses shows that this is
not the case (Jütte, 2005: 63-70; Cahill, 2009; San Roque et al., 2015: 34-35). This ordering
32
can be traced as far back as Aristotle, and although it has certainly been disputed, it seems to have remained the common opinion ever since (ibid.). It would seem that Hamilakis (2014) is not interested in actual perceptual experience, which he believes is the same in all peoples, but in the categorisation of sensory modalities. This may be important for understanding certain elements of a culture, but is far less important for understanding past people’s interaction with the world.

It is evident that some areas of study are more open to the incorporation of a particular sense than others. The various proxemic distances (Hall, 1966), ranging from the intimate to the public, each involve a different subset of senses; whilst taste and touch are only useful when you are within arm’s reach of the object of your perception, smell has a greater potential sensible distance, hearing’s is even greater and vision’s is greater still (Fig. 1.1). This of course assumes individuals with no sensual impairments or external aids. Hall (1963: 1005, 1015) noted that these proxemic and sensory zones were “bio-basic”; they are rooted in the physiology of an organism. Of course, these zones do not have solid boundaries, they are somewhat permeable and not strictly defined, but the general trend is one of decreasing sensory involvement further from the organism. Therefore, research which focuses on long distance interactions, such as landscape studies, are most suited to study through vision, the other senses being implicated to a limited degree at these ranges.

Gordon (1989: 10-11) has noted that “our waking experience is largely visual” and that our description of experience reflects this, with far more adjectives being available for visual perception than for smell or sound. Given this, it is not surprising that Hamilakis (2011) has
found the language of archaeology to be predominantly visual, for it to be any other way would be unusual, and it must be recognised that we cannot be accused of conceptual bias simply due to the constraints of the language we speak. Indeed, it may be that our language is not biasing us, but that our language is shaped by something inherent to human biology and/or psychology. San Roque et al. (2015) studied the frequency of perceptual terms in recorded conversations in 13 languages; Avatime, in Ghana; Cha’palaa, in Ecuador; Chintang, in Nepal; Duna, in Papua New Guinea; English, in the USA; Italian, in Italy; Lao, in Laos; Mandarin, in Taiwan; Semai, in Malaysia; Siwu, in Ghana; Spanish, in Colombia; Tzeltal, in Mexico and Whitesands, in Vanuatu. They found that for all languages but Tzeltal visual verbs were more common in conversation than all other sensory verbs combined; for Tzeltal visual verbs were second most frequent (ibid.). Tzeltal includes a multi-sense verb which was the most commonly used perceptual verb, though it is usually used to mean understanding (San Roque et al., 2015: 45). When the analysis was restricted to just usages relating to actual perception visual verbs were the most common in all languages (ibid.).

For vision to dominate across this broad range of languages suggests that there is something about humans that preferences vision, rather than it being a cultural, especially western thing. One possibility is that this has a biological cause, but San Roque et al. (2015: 50) suggest two other possibilities. The first is that there are more opportunities to talk about visual perception than the other senses (ibid.). The second is that perceptual language is related to both sensory perception and social interaction; visual experiences are more regularly shared with others than those of the other senses (ibid.). Both of San Roque et al.’s alternatives would reinforce the concept of proxemics and all three demonstrate the importance of vision.

Perceptual research has also shown that vision is dominant (Gordon, 1989: 10), as illustrated, for example, by the MacGurk effect, in which visual cues override auditory information (MacGurk and Macdonald, 1976). Vision has a similar relationship with the haptic senses; Flanagan and Beltzner (2000) have shown that baresthesia, the perception of weight, is affected by the size of an object, with the larger of two objects of the same weight being considered heavier. Botvinick and Cohen (1998) have shown that people feel sensations in a model hand when theirs is hidden, and Congedo, Lécuyer and Gentaz (2006) found that when spatial stimuli are delocated, visual stimuli take dominance over proprioceptive ones. These
effects may be because 70% of sensory input the brain receives is from the eyes, and 50% of the cortex is involved in visual function (Snowden et al., 2012: 14; Helvie, 2011: 48). Whilst we must be careful about generalising about humans as a whole, the weight of neurological, experimental and linguistic evidence suggests the dominance of vision in our species.

Whilst this may hold true for the majority of people, we cannot deny the possibility of people for whom this is not the case. The obvious example is people who are blind, but it may also extend to synaesthetes. Synaesthesia is a perceptual condition that results in the stimulation of one sense triggering an automatic response in another (UK Synaesthesia Association, no date). Estimates for the frequency of people with synaesthesia range from one in 10,000, to one in 5,000 (Gross, no date). Synaesthesia reminds us that just because the majority of people seem to have vision as their dominant sense, this is not necessarily the case for all people. The existence of a type of synaesthesia in which words and concepts are perceived spatially in relation to one’s position (UK Synaesthesia Association, no date) is a particularly interesting case for the study of landscapes, suggesting the possibility of a site’s or landscape’s spatial structure being linked to a concept as perceived from a certain location or during certain activities.

This raises interesting possibilities for the interpretation of the archaeological record; there were likely synaesthetes and people for whom vision was not the dominant sense in the past who would have produced material culture, and could even have had key roles in society. What they produced could be quite different from what another person might, and as such, could have very different meanings. The rarity of synaesthesia and the many types make it unlikely that such material culture survives, that we could ever interpret it, or that it had a significant effect upon past cultures in the longer term. Whilst these alternate ways of viewing the world hold interesting possibilities, the ‘normal’ perceptual experience of humans as a whole nonetheless remains one of visual dominance, and it is this arrangement of sensory modalities that is most likely to have had the greatest impact on the archaeological record.

There is no doubt that the charges of ocularcentrism raise an important concern; it is important that we acknowledge the entire sensorium in our research, however, there are some subjects for which a more focused approach is suitable. The levels of resources that can be devoted to a project are an additional concern that may necessitate a narrower approach.
The longevity of sensory stimuli is also an important factor for archaeological study; visual stimuli are often of a lasting nature, and when it comes to landscape those stimuli perceivable without direct interaction are primarily visual. Smells and sounds meanwhile tend to be far more transient, as they must be actively produced, and disperse with time and distance. Given that the past sources of these stimuli are unlikely to be present in the modern landscape, a large degree of speculation is required to bring them into our interpretations (Llobera, 2007: 52). It is also evident that the richness of visual language, especially as related to spatiality, affords investigation and allows for easier dissemination of results. An archaeology of sound or smell is far more difficult to write, read and understand.

Given that the aim of this research is to critique current practice in landscape archaeology, it is necessary to explore the sensory modality which is most relevant for landscape study and which is most widely explored in this context. This is not to say that we should ignore other possibilities of engagement with the landscape, or that there is no place for a multi-sensory account of spatiality. The use of proxemics may help to define what senses are implicated in different research contexts, and how. For example, different zones might have been perceived as one moved through the wider landscape. Wheatley (2014: 124) has advocated the use of proxemics to understand the implications different senses have upon the formation of spatial structure, and for vision in particular he advocates the use of Higuchi’s (1988) landscape zones. A prime candidate for the analysis of this sensorial structure would be a theatre, in which a large space is subdivided whilst making allowances for vision, hearing, touch and importantly, social class.

The attempts to discredit visual research have been misguided; rather than focusing on the other senses, the aim in archaeological research should be to create a truly multisensory account. However, instead of asking every piece of research to be multi-sensory, which is evidently impractical, we must be aware of the greater picture and drive, in the longer term, towards this goal. Given this, plus the existing trends in landscape archaeology that this research aims to critique, the fact that visual research still has the potential for valuable insights, and the particular traits of vision and visual language, it is this mode of perception that this research will focus on.
1.10 Research Aims, Objectives and Methods

The main research question of this thesis, “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?” forms one strand of an assessment of the validity of using visuo-spatial approaches in landscape archaeology. There are other factors to be considered in a full discussion of this issue, such as methodology, landscape change from erosion and vegetation cover, modern development, and theoretical standpoint. These have been covered multiple times in the past however, and so they will not form a central part of this research.

This thesis has a number of primary aims which contribute to the research question, as well as secondary aims which intend to contribute to research by making use of the findings and methodology of the thesis. The primary aims are as follows:

1. Analyse and synthesise psychological research on the issue of cross-cultural perception in order to inform this thesis
2. Discern what may be directly learnt or inferred about past peoples’ perception from archaeological evidence
3. Assess the gaps in our knowledge of the perception of past people left from these two literature reviews, and outline how they can be filled
4. Propose “Perceptual Uniformitarianism” as a justification for carrying out a perceptual experiment with modern people
5. Determine what aspects of visuo-spatial perception, in a landscape context, may be affected by culture, and to what extent, through a perceptual experiment at Stonehenge
6. Assess the implications of the experiment’s results for archaeological research in general and landscape archaeology in particular, and in light of these evaluate how perceptual evidence and theory can be used to benefit further archaeological research
7. Assess the implications of the experiment’s results, for the presentation of interpretation to the public at archaeological sites, and for cultural resource management
The secondary aims of this research, which do not contribute to the research question, but which will make use of the findings of the primary aims, are as follows:

8. Assess the implications of this research’s findings for perceptual theory and determine what useful insights there may be for the field of psychology
9. Outline how the perceptual experiment may be used as a tool for crowdsourced interpretation
10. Discuss the implications of the experiment’s findings for research in the Stonehenge landscape

At the core of this research is the differences between the perception of people from different cultures. Aim 1 can be broken down into a number of objectives contributing to the understanding of this issue:

1A) Review literature giving an assessment of psychological theory on perception
1B) Review literature directly pertaining to cross-cultural perception
1C) Review literature pertaining to perceptual experiments
1D) Combine these strands of evidence into a theoretical synthesis

This will show whether psychological research holds insight into the issue of past perception and archaeologists have simply been unaware of it, or if there are still issues that need further research. Either way these reviews may help in answering the research question and allow the identification of different aspects of visual perception that may be affected by culture.

Aim 2 involves exploring archaeological evidence which may give clues about past visual perception and entails a number of objectives:

2A) Define the ways in which archaeological evidence may give us insight into past visual perception
2B) Review archaeological evidence pertaining to explicitly spatial information, such as maps and geoglyphs
2C) Give an overview of insights which may be gained from rock art

The third aim will involve:
3A) Bringing the previously examined areas of evidence together in order to ascertain what can and cannot be determined about the relationship between past and modern people’s perception at this time

3B) Identification of any gaps in knowledge that need to be filled, informing the future progress of this research

3C) Development of a methodology for testing the effects of culture on visual perception of the landscape

In order to carry out such an experiment modern people must necessarily be studied; therefore the fourth aim of this research is to propose a new concept, “Perceptual Uniformitarianism”, as a justification for using data collected from modern people to explore the issue of cross-cultural variation in visual perception. This will involve:

4A) Outlining the concept as a development of the concept of uniformitarianism

4B) Demonstrating that by gauging variance in the perception of people from modern cultures, insight can be gained into the potential size of the variance between past and modern people

Carrying out such an experiment is the fifth aim of this research and will involve:

5A) Selecting an appropriate landscape for the experiment

5B) Determining the best way to structure and deliver the experiment

5C) Designing the experiment content

5D) Undertaking the experiment

5E) Analysing the experimental results

The sixth aim will involve:

6A) Discussing the implications of the experimental results for archaeological landscape interpretation

6B) Proposing how to proceed with archaeological interpretation

6C) Establishing a perceptually valid archaeological vocabulary

The response to this aim will vary somewhat depending on the outcome of the perceptual experiment. The results will determine whether there is any correlation between our observations of the landscape and our background influences, and thus whether modern
archaeologists can see and interpret the landscape appropriately. If despite differing cultural attitudes and biases, the landscape is perceived in a very similar way by all/most participants, then we might argue that there is a universal, perhaps innate, aspect to this part of perception. This would mean that the gap between past and present perception of the landscape would likely not be very large. If the opposite is true however, then it is clear that our perception, as modern researchers, is going to be very different from the peoples we are studying, at least in some cases. If this is so, then it is the task of archaeologists to find out how, where/when and perhaps why.

Whatever the result, the debate of to what extent culture affects perception will be added to with an ecologically valid perceptual experiment, and there will be implications for archaeological research to be discussed. If culture has a significant effect on perception, attempts to understand the meaning attributed to sites and landscapes by past peoples would be, at best, possible accounts based on possibly relevant observations. At worst they would be almost valueless for an epistemologically realist archaeology, indicating more about the author in their modern context than the beliefs and practices of past peoples. If there is an element of universality to our perception of landscape however, then archaeologists could be said to have a solid foundation to work from. Whilst many different hypotheses can of course be drawn from the same visuo-spatial observations, we could be far more confident that at least we are collecting the right data in the first place.

Should this research find that current visuo-spatial approaches to landscape are not valid a new theoretical stance must be taken. It is therefore important that a discussion of the possible reactions to the findings form a part of this research. The result, if necessary, must be a guide for a new direction and not nihilistic acceptance. Creating the beginnings of a perceptually valid archaeological vocabulary, based on aspects of commonality in perception would be a key step.

Part of the response to the results will no doubt involve making good use of perceptual theory. Defining how this can be of use to archaeological research, both in this specific context and others, will be a key element of responding to the experiment. Perceptual theory could help us in our research in a number of ways. Along with the experimental results it could highlight which aspects of the material record we can and cannot talk about with confidence.
It may even offer possibilities for how we might become more confident in talking about the more difficult aspects of the record. Such use may also open up completely new avenues of enquiry and guide current research. It is therefore an important epistemological tool, which has not yet received enough critical attention in archaeology.

The experiment results will also give important information about modern perceptual variation. The seventh aim will therefore involve:

7A) Discussing the implications of the results for archaeological presentation
7B) Discussing the implications of the results for Cultural resource Management
7B) Discussing how site presentation practice may need to adapt given the findings

The eighth aim will involve:

8A) Discussing the implications of the literature review for perceptual research
8B) Discussing the results of the experiment for perceptual research

The experiment will serve as the first instance of such a crowdsourced landscape investigation, providing information about the Stonehenge landscape. The ninth and tenth aims will involve:

9A) Discussing the success of the experiment methodology as a crowdsourced landscape interpretation tool
9B) Discussing how such a methodology may contribute to landscape archaeology

10A) Discussing any findings which relate to the interpretation of the Stonehenge landscape
10B) Discuss any novel interpretations which would benefit from further investigation

Finally, it is hoped that this research will help to raise awareness of some of the epistemic problems facing archaeology, which are so often ignored or glossed over (Gardner and Cochrane, 2011: 12).
1.11 Summary and Thesis Outline

This chapter has outlined a problem at the foundation of archaeological knowledge creation; that we have no clear conception of how the perception of modern archaeologists relates to that of the people from the past cultures we study, nor to the public to which we present this knowledge at archaeological sites. It has shown how this issue has been approached by archaeologists in the past, typically in a landscape context or museum, though it in fact applies to many areas of archaeology. These approaches can be summarised as:

- dismissal of the problem (Thomas, 2001; Duke 2007; Hughes et al., 2013);
- pessimism (Smith and Bludnell, 2004; Liwieratos, 2009);
- skepticism (Shanks and Tilley, 1992);
- apparent ignorance (Nash, 1997; Pollard and Reynolds, 2002; Van Dyke, 2003; Eagles and Field, 2004; Cummings and Whittle, 2004; Brophy and Millican, 2015; Contreras, 2015; Jones et al., 2015; Llobera, 2015; Scarre, 2015; Flores, 2017; Monteith, 2017);
- a reliance on training and experience (Aston and Rowley, 1974; Rippon, 2004);
- the adoption of a phenomenological standpoint (Tilley, 1994; Eve, 2014);
- acknowledgement that more work needs to be done (Hu, 2012; Skeates, 2010);
- unsupported attempts to resolve the issue (Zubrow, 1994);
- an acceptance that archaeologists must better understand cultural variation (Merriman, 1999b; Owen, 1999; Sørensen, 1999; Wood and Cotton, 1999; Hooper-Greenhill, 2000; Aplin, 2002);
- a desire to be honest with the public about interpretive issues (Buckley, 1999: 44; Jameson, 1999: 597; Merriman, 1999b: 620; Frodsham, 2004: 10);

Much landscape archaeology research makes no mention of how the observations of modern day archaeologists correspond to those of past peoples, nor how their interpretations may be dependent upon this correspondence. This failure to acknowledge the issue extends outside the research environment as well. Commercial archaeological contractors have the requirement of turning observations and surveys into interpretation listed in their project
scopes, as this is specified by Historic England (English Heritage, 2007), but the guidance has no reference to the problems inherent in the act. Meanwhile, whilst work on presentation shows awareness of the need to tailor content to the audience, the issue of perpetual variation does not feature. Archaeological approaches to perception have therefore been shown to fall short of fully engaging with the issue of cross-cultural perception. This lack of investigation into the perceptual roots of archaeological knowledge creation is an implicit and untheorised acceptance of the data we use (even if one takes a sceptical position) of the sort Johnson (2007) highlighted.

Gibbon (2005), Gardner and Cochrane (2011) believe that the implications of our work need to be engaged with more critically, and that their epistemological foundations need to be made stronger and more explicit. The research question of this thesis, “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?” has therefore been formulated to do just that. Through an analysis of the nature of the various sensory modalities, with reference to landscapes and the history of landscape archaeology, it has been argued that this thesis will benefit from focusing on visual perception.

Landscape, visual perception and visuo-spatial data have been defined for the purpose of this research. Landscape has been defined as the the fixed, physical, temporally durable, built and natural features of an area, whether human or naturally made, grown or modified, before meaning has been layered on top. It is ontologically basic and thus prior to such additional layers. In this way, it is distinct from environment and context. Visual perception has been defined as literal sensory perception, and not any higher order mental processes. It is the picking up of the fundamental qualities of the world (shape, size, colour, location and possibly affordances) with the eyes, via light. Visuo-spatial data has been defined as spatial attributes and relationships that are primarily perceived visually.

The rest of this thesis will aim to further explore the issue of potential differences in the visual perception of past and modern people through fulfilling the aims and objectives outlined above. Chapter 2 will provide analysis of psychological theories of perception and some prominent philosophical standpoints in order to determine what insight these may offer into the issue of cross-cultural and indeed cross-temporal perceptual variation.
Chapter 3 will build upon this by analysing experiments that have explicitly looked at inter-group variation, using culture as the differentiator. Whilst some of this work is outdated and suffers from serious methodological and reporting problems, careful examination does still offer potential insights. Chapter 3 will also consider ecological experiments which have aimed to differentiate between nature and nurture in perception. The results of this analysis will be considered alongside the assertions of perceptual theories and those theories deemed to be the most sound will be brought together to create a theoretical synthesis. This synthesis of theory and experimental results will be used to determine how current knowledge stands in relation to the extent to which there is a commonality between the perception of people from different cultures. This thesis will not investigate anthropological literature for information on cross-cultural variation for two reasons. The first is that each piece of anthropological research will have its own approaches, and whilst there may be similar research frameworks, the data will not be directly comparable; different studies do not subject groups to the same questions or stimuli. In comparison, many psychological experiments make repeated use of the same materials, and present statistical data, allowing for direct comparisons between different cultural groups. This direct comparison allows a better understanding of variation than would be possible from the anthropological literature. Secondly, whilst anthropological data may give insight into how different cultures conceptualise visual perception, this does not demonstrate how they actually perceive, as discussed earlier with extramission.

Chapter 4 describes ways in which archaeological evidence might give us clues about past people’s perception by looking at maps, geoglyphs and rock art.

In Chapter 5, the ways in which perceptual research can be applied to archaeology, and the theoretical pitfalls involved, will be detailed. In light of the analysis in Chapters 2, 3 and 4, Chapter 5 offers a rationale for carrying out an archaeological perceptual experiment in order to help answer the research question. A key aspect of this will be the development of a key underlying archaeological assumption, uniformitarianism, into a new principle, Perceptual Uniformitarianism. This chapter will also examine the possible outcomes of this research given the potential results of the experiment.

Chapter 6 presents the methodology for the perceptual archaeological experiment. This is aimed at taking perceptual and archaeological work further, in an attempt to directly answer
the question of to what extent culture has an effect on the visual perception of the landscape. This chapter will also detail the uses to which the resulting data will be put, and the analysis which it will undergo. Chapter 7 presents and analyses the results of this experiment.

Whilst landscape archaeology is the focus of this research, its results have implications for nearly all of archaeological knowledge creation, since all of our interpretation and presentation is based on evidence gathered in a modern, usually western, research context. Chapter 8 discusses the experimental results in light of the preceding theoretical narrative, and examines the implications of this research for archaeological discourse and dissemination. The implications for crowdsourced landscape archaeology methodologies, research in the experiment landscape, and for perceptual theory, are also considered.

This first chapter has aimed to show that the study of perception is vital for better understanding the world around us. Advances in our understanding of how and why we see the world as we do will enable us to better assess the judgements we make about the world, and thus the archaeological record. In addition, by constructing perceptual theories and models, and through experimental research, it may possible for us to gain a better understanding of past peoples and how to share our knowledge with the public. This process will start with Chapter 2.
2 Visual Perception

2.1 Introduction

The analysis of psychological research separates this thesis from previous archaeological work on landscapes and perception which have focused more readily on philosophical arguments. Therefore, the purpose of this chapter is to outline the current state of perceptual theory and determine whether this holds any insight into the issue of cross-cultural perception. From this we may be able to make inferences about the relationship between the visual perception of landscapes and culture in both modern and past populations.

The physiology and individual processes involved in many parts of perception, such as edge detection, direction discrimination etc. are relatively well understood (Harris, 2014; Park and Chun, 2014; Wolfe et al., 2015), but how this all comes together to form a useful system for understanding and responding to the environment is less apparent. This chapter will briefly assess various theories against the requirement to adequately explain perception and account for experimental evidence. It is this explanatory value which is important, rather than any predetermined view on what may or may not be of use for archaeology. Implications for archaeological research will therefore be discussed in the chapter summary, but will not be used as a benchmark in assessing the theories.

To begin with, it may be of use to give a general overview of the different trends within approaches to visual perception. At the most general level they can be divided into those that argue from physics, physiology, psychology and philosophy, some making use of subjective accounts and demonstrations, others controlled experiments. Some approaches focus exclusively on perception, whilst others closely link cognition and perception in their discussions.

Some theorists believe perception to be an innate ability which, although influenced by learning and attention, is present from birth; they are known as Nativists, and include Ecological and Gestalt theorists (Gibson, 1986; Gordon, 1989: 68). Others liken perception to high level cognitive processes (Bruner, 1957), arguing that we use knowledge in perception
They therefore assert that what we perceive is the result of interpretation of sensory information using previous knowledge (ibid.).

Visual theorists can also be divided into externalists and internalists. Externalists, or direct realists, maintain that we relate directly to the external world (Gibson, 1986; Malafouris and Renfrew, 2010b). Internalists, or indirect realists, believe perception depends on internal representations, and does not have a direct ontological relation to the world (Robinson, 2001; Snowden et al., 2006) but is determined by the nature of the viewer, to a greater or lesser extent. Finally, some consider perception to be an essentially passive process, whilst others assert the importance of active participation in perception (Gordon, 1989; Köhler, 1947; Nöe, 2004).

There are of course cross-overs between these different approaches, and theories continue to influence and build upon each other. They also take inspiration from other disciplines, for example in the case of phenomenology, ecological perception, and computer vision approaches. For the sake of clarity and better analysis, however, each approach will be addressed individually and only the elements pertinent to an account of visual perception will be addressed, rather than how they are utilised for other disciplines or contexts. This approach follows that found in many visual perception textbooks (for example Gordon, 1989; Gregory, 1998; Locke, 2002; Harris, 2014).

2.2 Requirements for Explaining Visual Perception

The purpose of perception is to give us awareness of our surroundings, and so allow us to interact with them. The basic requirement for a theory of visual perception is to adequately explain how it is that we are aware of the world. A number of further requirements for theories of visual perception have been identified in psychological literature. Gordon (1989) notes that if a theory of perception is to be deemed a success it must be comprehensive. All aspects of vision are inherently part of the whole, and thus if any account of perception is to be deemed valid it must address all aspects of vision satisfactorily. The division and discrimination of objects experienced through vision can be considered to be made up of a number of smaller elements; edge perception, shape perception and colour perception. Shape perception involves shape and size constancy, understanding that the shape is the
same when viewed from different angles and distances, and shape completion, understanding that a shape continues beyond the surfaces that can be seen from any one position. Colour perception involves colour constancy, perceiving objects as the correct colour despite variations in illumination.

The role of awareness must also be explained since even if the eyes are pointing at something, it does not mean that the person will actually see it (Snowden et al., 2006: 256); there is a further requirement for perception. This is due, in part, to attention (ibid.: 258-259). Another element often seen as important to explain, is the perceived stability of the world and the continuity of our perception despite body movement and the rapid saccades of the eyes (Gibson, 1986).

Theories of visual perception must also adequately explain the reasons for misperception and illusion. A classic example is the Müller-Lyer illusion (Fig. 2.1), in which two lines of equal length are perceived to be different lengths. Illusions are one of the most widely discussed and recognised problems in perceptual research, since we would not expect a useful perceptual system to result in such dramatic misconceptions (Allport and Pettigrew, 1957; Gregor and McPhearson, 1965; Segall et al., 1966; Davidoff, 1975; Ahluwalia, 1978; Deregowski, 1980).

![Figure 2.1-The Müller-Lyer illusion. The line on the left is perceived to be shorter than the one on the right, when they are in fact of equal length. This effect is caused by the fins on each line.](image-url)
Depth perception and spatial perception are also key aspects of understanding visual perception, since to interact with the world we must have accurate knowledge of where objects are. This is complicated by the fact that both we and the objects move. The perception of movement is therefore also important for our interaction with the world (Gibson, 1986).

Finally, whilst any theory of visual perception needs to explain the realities of our experience, some also argue that it must also explain the visual system of other mammals and even fauna which have very different structures to their visual organs (Gordon, 1989); any theory based around the structure of the human eye will limit its explanatory value. One could equally argue however, that organisms which are so different may well perceive in a very different way.

2.3 Approaches to Visual Perception

2.3.1 Phenomenology

Whilst the way it is used varies depending on the researcher (Eve, 2014), phenomenology is the most frequent explicitly perceptual approach within archaeology, and so it is logical to start here. It is a phenomenological outlook which led to Tilley’s (2004: 34) assertion of a “prereflective embodied consciousness”; but this assertion alone is not enough. The reasoning behind it must be testable if we are to have confidence in using it as a basis for our understanding. This section will discern whether phenomenology can meet the benchmark laid out for perceptual theories.

Phenomenology has been conceptualised in different ways, but at its core it attempts to understand the world through describing phenomena as they present themselves in the consciousness of the observer (Moran, 2000). It is based on the human body’s direct interaction with its environment (Johnson, 2010: 117; Merleau-Ponty, 2002; Marshall, 2008), and every external perception is synonymous with a perception of one’s own body (Merleau-Ponty, 2002: 237; 239). Phenomenologists assert that the world is experienced through a series of individual self-directed views, each linked by our knowledge of a persistent self and environment (Merleau-Ponty, 2002: 235-236).
For Merleau-Ponty, perception is not an action, but the starting point for everything else; it is presupposed by all other acts (Merleau-Ponty, 2002: xii). Before explanations are assigned to experience through external concepts, such as common sense, cultural tradition or the scientific method, phenomena must be “understood from within” (Moran, 2000: 4-5). Phenomenology therefore aims to explain perception prior to outside influence (ibid.).

In phenomenology the actions of others are understood through analogy with oneself; a shared body schema ensuring correspondence (ibid.: 406-412; 472). It is this emphasis on the body, and the assertion that the significance of objects is inherent within them, not given by the observer, which has led to archaeologists adopting phenomenology. It allows for the assumption of unified experience between people of the past and the present.

Merleau-Ponty denies any traditional sense of objectivism, instead replacing it with his own objectivity, based in the confluence of each individual’s perceptual world (Marshall, 2008: 125-126; 202). However, his work denies the possibility of phenomenology being used unquestionably in archaeology since he believes that the certainty of this unity collapses under the weight of geographic and temporal distance (Merleau-Ponty, 2002: 472). We can never be certain, he argues, that we are looking at the same Mount Hymettus as the ancient Greeks (ibid.). When one considers the task facing archaeologists in the interpretation of the archaeological record, which, as is discussed in Chapter 5, is far from an accurate representation of the past, this argument gains even greater importance. Archaeologists can never be said to be “looking at the same Mount Hymettus” (ibid.), and so the unity of perception implied by phenomenology is fractured. Whilst we may indeed see the world in the same way, the world we are seeing is very different. For site presentation this may be less of an issue, but for archaeological interpretation it is an important consideration. A common body schema does not by necessity lead to common experience either; some societies have very different conceptions of the body and the individual, which could fundamentally alter how one experiences a given situation or environment (Johnson, 2010: 118).

Early proponents of phenomenology believed it escaped the underlying assumptions about human experience in psychological studies by exploring perception through thought experiments and the examination of their own experience (Moran, 2000; Eve, 2014: 13). Of course one might ask how phenomenologists escape from their own underlying assumptions,
and since they are gathering no data except their own observations, there is no possibility of highlighting and disproving any such assumptions. Whilst the most used perceptual approach in archaeology, phenomenology fails to meet the requirements of a perceptual theory outlined above and provides no compelling evidence that perception works in this way.

2.3.2 Gestalt Theory

One of the earliest significant perceptual theories was Gestalt theory. It arose from the work of two individuals; the first, Christian von Ehrenfels (1890), drew attention to the fact that the quality of things amounts to more than the sum of their constituent parts (Fig. 2.2). “A square is more than a simple assembly of lines- it has ‘squareness’”; he called this gestaltqualitäten (Gordon, 1989: 49). The second was Edgar Rubin (1915), who distinguished between figure and ground in visual perception. Figure-ground illusions involve the continual swapping of the object of attention; the background becomes the object and the object the background (Fig. 2.2).

Kurt Koffka and Wolfgang Köhler adopted these concepts in their attempts to explain aspects of perception such as size and colour constancy, the stability of the perceived world and the coherence of perceptual experience (Gordon, 1989: 49). They maintained that perceptual theories had to explain everyday perceptual experience, rather than abstract experiments (ibid.). Due to the importance given to gestaltqualitäten, Gestalt theorists reject the possibility of stimuli as isolatable events; context is vital for any explanation of our perception (Gordon, 1989: 55). The Müller-Lyer illusion (Fig. 2.1) is a prime example of this; it is the context of the fins which creates the misperception. For Gestalt theorists, the relationship between an object and its environmental context explains constancy in visual perception; “The constancy of brightness... depends on the relation of the illumination... of the surrounding field to the brightness of the object” (Köhler, 1947), whilst colour constancy is explained by relative reflectancies (Gordon, 1989). However, experiments involving the amplification of light received by the eye have shown that colour constancy is maintained, despite an increase in the amount of light entering the eye without a corresponding increase in luminosity in the scene (Gordon, 1989: 66). Gordon thus argues that this explanation is unsatisfactory. However, one might argue that the eye recognises and compensates for the additional light.
Another key principle is prägnanz; the tendency of visual information to form patterns and/or become simplified (Fig. 2.2) (Gordon, 1989). Examples include the ordering of a grid of dots into lines/shapes, or the perception of familiar shapes such as faces in cloud formations (ibid.). Although Gestalt theorists brought attention to these principles, they did not successfully explain them, their attempts to do so often resulting in circular reasoning (Gordon, 1989). In addition, despite the emphasis on explaining everyday perceptual experience, many of the Gestalt demonstrations have what Gordon (1989: 67) calls, low “ecological validity”; the stimuli are not representative of those we perceive in our everyday lives. Many are based on two-dimensional effects which, when translated into three dimensions, no longer work. A prime example is the Müller-Lyer illusion, which when seen in three dimensions through an anaglyph image no longer causes misperception (Fig. 2.3). Although important for highlighting many previously unnoticed aspects of visual perception, the Gestalt theory fails to provide a complete and satisfactory theory to apply to our perception of the natural world.

Figure 2.6- Examples of Gestalt principles. (a) An example of Rubin’s Vase, a figure/ground relation; both a vase and two faces are visible. (b) A demonstration gestaltqualitäten; the three segmented circles suggest the presence of a triangle which is not in fact there. (c) A demonstration of prägnanz; although the 9 dots are separate, there is a tendency to group them into rows and columns.
2.3.3 Probabilistic Functionalism

Probabilistic Functionalism was initially developed by Egon Brunswik, and similar stances have since been adopted by others (see Gregory, 1998; 2002). He believed that perceptual research should reflect a perceptual system’s value for survival, as any perceptual system is the result of a long process of evolution in a complex world (Gordon, 1989: 76). For Brunswik, visual cues from the world are probabilistic; one never receives entirely dependable information (Gordon, 1989: 76-78). Thus perception is a series of quickly made gambles, aimed at maximising chances of survival at the expense of precision (ibid.). The perceiver must be an “intuitive statistician” in order to interact with the external world, using past successes and failures to weight decisions (Gordon, 1989: 89).

With Brunswik’s approach, certain aspects of perception, such as constancy and illusions, can be simply explained as successful and unsuccessful gambles. There are some serious problems however. Firstly, there is the issue of sustained misperception; even after one has experienced an illusion and learnt what causes it, the effect persists. This contradicts the assertion that past experience improves the perceiver’s ability to correctly gamble on the actual nature of the environment. In addition, there is evidence which suggests that some aspects of perception may in fact be innate, or at least develop very early (Walk, 1981; Bornstein et al., 1976; Bornstein, 1990).
We must also be wary of the implication that evolution is a process by which organisms continually improve. Evolution merely favours traits which increase the chance of their reproduction in the current context, this does not necessarily result in a generally useful system or in positive traits, especially once that context has changed. Brusnwick’s emphasis on experience and evolutionary driven efficiency is therefore flawed. In addition to these problems, Probabilistic Functionalism does not consider a number of the key requirements noted above. Given these shortcomings it cannot be considered an adequate theory for explaining visual perception.

2.3.4 Psychological Empiricism

Psychological Empiricism is an approach related to Probabilistic Functionalism, but which is more general in its scope. Psychological Empiricists see perception as a constructive process, open to control by central factors, where sensory information itself is inadequate; the brain processes this information in order to form perceptual content (Gordon, 1989). Helmholtz (2000) saw this as an act of unconscious inferences, and others, such as Bruner (1957) and Gregory (2002), have formalised this idea into one of hypotheses, which are tested against external evidence. Such concepts could easily explain the problems of constancy; the brain simply needs to process the incoming information to arrive at the appropriate perception (Gordon, 1989: 126).

These ideas developed out of a number of experiments which suggest that perception involves more than simply the input of sensory information. In one such experiment, Külpe (1904) used a tachistoscope to deliver brief exposures of coloured letters and asked subjects to focus on particular aspects of the display, e.g. position. Subsequently, when asked to describe other aspects of the display, they could not (ibid.). All of the sensory information had reached the eye, but between this and the final perception, the perceptual system had selected only the pertinent information to attend to (ibid.). Other experiments indicated that as well as attention, hunger (Sanford, 1936) and one’s expectations (Bartlett, 1932), can interfere with and alter perceptions. One of the best examples comes from an experiment performed by Bruner et al. (1951), in which a tachistoscope was used to display playing cards to subjects. Some cards had altered suit colours, and while some participants made correct responses, others reported “compromise perceptions”, such as purple hearts (ibid.). A
compromise had been reached between the actual properties of the stimulus and the perceiver’s inherent knowledge about playing cards.

Richard Gregory (1980a; 1980b) formulated these findings into what he called the Hypothesis Theory. He noted that we recognise things for what they are even though we can almost never see the entire object (Gordon, 1989: 133-134). Surely then, he argues, we must use more than simply sensory information in order to arrive at the perception of objects (ibid.). Next he notes that familiarity has two effects; it allows us to extract familiar items from background clutter, and it allows for the use of skills with no time delay (ibid.). If, for example, a subject is asked to track a moving target with a pointer, the task involves no time delay if the route is regular and predictable (ibid.). Gregory also demonstrates that perception can be ambiguous or paradoxical, and that unlikely objects tend to be mistaken for more likely ones. Examples of this include the Necker Cube, the Devil’s Pitchfork, and the hollow mask illusion (Figures 2.4, 2.5 and 2.6) (Gordon, 1989). Thus perception cannot be linked to stimulation directly; it is controlled by “irresistible inferences” (ibid.).

Figures 2.4, 2.5 and 2.6 can also be used to demonstrate another of Gregory’s assertions; that we can perceive things as representing something else entirely (Gordon, 1989: 135). The Necker cube for example is nothing more than a two-dimensional arrangement of lines. Pictures are ambiguous, yet we easily perceive them as the things which they are intended to depict, he therefore argues that there must be a large cognitive element involved (ibid.). His final observations are that we can perceive things even in the absence of stimulation (i.e. hallucinations, although see Section 2.3.7) and that the impressions we gain from perception can be influenced by things of which we are not directly aware (ibid.). For example, increasing the size of an individual’s pupils in a photograph will make them appear more attractive, even if the alteration is too small to be noticed (ibid.).

Figure 2.13- A Necker Cube. Although a two-dimensional drawing, this is perceived as a three-dimensional object. However, because of the lack of depth cues, for example, apparent diminished size with distance, perception of the orientation and identification of the front most face, changes as one looks at it.
Gregory applied his theory to the Müller-Lyer illusion (Fig. 2.1), developing an argument for how the illusion occurs; we form a hypothesis from the drawing as though it were three-dimensional (Gordon, 1989: 135-136). We therefore read depth cues in the drawing and a size constancy mechanism is applied inappropriately; we recognise that the lines are the same size, but the one on the left appears as though it is further from us, it is therefore perceived as being larger. Much like Probabilistic Functionalism, Psychological Empricism takes quite a
broad view of perception and does not explore some of the details of visual perception mentioned in Section 2.2; however, its primary assertion could be seen as negating the need to investigate each of these individually; the same process applies.

However, the various forms of Psychological Empiricism, although backed by some compelling demonstrations and experiments, nevertheless have a number of considerable problems. First and foremost are those which undermine Brunswik’s work; sustained misperception and the apparently innate aspects of perception. In addition, Gordon (1989: 138) asks how perception can ever start in the first place if it is a constructive process based on past knowledge. This knowledge can only be acquired through perception after all. Gordon (1989: 139) also argues that this model cannot be applied to many other animals; he proposes that a mayfly would not have time to formulate and test hypotheses, yet it can evidently still see. Another major problem with these theories is that hypothesis modification is not explained; what is the mechanism for perceivers modifying their perceptions, and how does this vary between gradual perceptual adjustment and rapid learning (Gordon, 1989: 137)?

Some of the evidence used to support these theories can also be criticised. A number of their key arguments are based on evidence from studies making use of tachistoscopes, which do not accurately represent our everyday visual experience. This will be discussed more in the next section, but it is of note that the failures of perception described above would be unlikely had the participants been given enough time to view the stimulus. Outside the experimental setting more time would be available, and any confusion, such as the miscoloured suits would likely have resulted in a longer fixation than normal. Psychological Empiricism then, whilst having some compelling arguments, does not offer an adequate explanation of visual perception.

2.3.5 Ecological Perception

The theory of Ecological Perception, first developed by James Gibson (1986), stresses the importance of considering the natural environment in the study of perception, as opposed to abstract artificial stimuli; this could be seen as the natural extension of the Gestalt focus on the importance of context. Gibson raised serious doubts about ‘snapshot’ vision with his “Lorgnette Tachistoscope” and sought to replace this idea with the transformation of
stimulation over time (ibid.). By basing his theory on this, Gibson was capable of overcoming one of the issues facing visual perception from the outset; incorporating time as a primary feature of the perceptual process makes all perception motion perception, and he therefore did not have to explain this phenomenon as ‘snapshot’ based theories must (Wade and Swanston, 1991: 3). There are two main elements to Ecological Perception; perception of the environment and the perception of opportunities for action, known as affordances.

The foundation of Gibson’s theory is that there are four types of vision, each with increasing amounts of mobility. The first is the model adopted by many theories, that of ‘snapshot vision’; a momentary fixation on a single point (Gibson, 1986: 1). This type of vision only exists in a laboratory setting (ibid.). The next is ‘aperture vision’, where the eye scans a scene, followed by ‘ambient vision’ in which the head turns, and finally ‘ambulatory vision’, which involves movement around the environment (ibid.). In ambulatory vision the perceptual system becomes the entire body nested within the environment (Gibson, 1986: 240). Due to this focus on movement, Gibson rejected the notion of an entirely subjective “private” environment (1986: 43). Through movement we can all occupy the same places and perceptually experience all viewpoints:

“Insofar as the habitat has a persisting substantial layout... all its inhabitants have an equal opportunity to explore it.” (ibid.)

Gibson was particularly critical of laboratory experimentation, arguing that under such conditions perceptual processes are not reduced to their elementary components, but rather to an unrepresentative and impoverished form (Gibson, 1986).

For Gibson (1986: 55), the light that reaches the retina is in itself not the basis of perception, but the information which it conveys; stimulation is a necessary condition for visual perception, but there must also be sensory information.

“Visual perception can fail not only for lack of stimulation but also for lack of stimulus information. In a homogenous ambient darkness, vision fails for lack of stimulation. In homogenous ambient light, vision fails for lack of information” (Gibson, 1986: 54)

The source of this sensory information is what Gibson calls the ambient optic array:
“To be an array means to have an arrangement, and to be ambient at a point means to surround a position in the environment that could be occupied by an observer” (Gibson, 1986: 65).

It is the arrangement, or structure of the ambient optic array which provides sensory information. The perception of, for example, a table and its rectangularity, comes from the interaction between the different views we have as we move in relation to it (Gibson, 1986: 74). Whilst there are changes caused by our locomotion, there are also constants in the table’s structure which order these changes, allowing us to see it as a coherent rectangular whole.

The importance of this optical structure has been demonstrated in an experiment by Eleanor Gibson (1969) in which animals were raised wearing translucent light diffusing goggles. Although degeneration of the photoreceptors did not occur, as with experiments in which animals were raised in the dark, the animals were partly blind (ibid.). They had been deprived of structure in the optic array, and thus the ability to adjust to changing stimuli had not developed (Gibson, 1986: 152). The importance of visual stimuli changing in a structured way is also clearly demonstrated by the work of Kohler (1964). Goggles which altered the light received by the eyes, so that light entering the left eye entered as though it were coming from an object on the right and vice versa, resulted in participants being unable to understand their surroundings. This experiment is discussed in more detail in Section 2.3.6.

It is of note that the animals in Eleanor Gibson’s experiment were not completely blind; there must then have been some aspects of their visual perception which did not require learning. Gibson (1986) suggested that whilst certain properties of vision are innate, perception becomes more subtle and accurate with learning. Arguably one of the most important factors in learning that requires a structured optical array is visual kinesthesis. Gibson believed this explained a number of the problems facing visual perception. If the visual system can detect its own movement whilst extracting information from ambient light, problems such as the apparent stability of the world despite head and eye movements disappear (Gibson, 1986: 220). Exteroception and proprioception are thus linked as part of the same process (Reed, 1988: 87). This proposition is supported by the observation that whilst the self-directed movements of the head or the saccades of the eye do not upset the perceived stability of the world, movement of the eye caused by external factors (say the
vibration of an electric toothbrush) does result in a view of the world which is not stable. As the movement is not self-actuated the perceptual system is not able to compensate for it.

This awareness of movement is explained by three factors; the first is the flow in the optic array. This is the way in which things seem to flow towards an observer as they move, and are then occluded at the edge of the visual field (the reverse occurs moving backwards) (Gibson, 1986; Harris, 2014: 276). The structured change and constants (or invariants) in the ambient optic array noted previously also allow for the second factor in awareness of movement. Invariants are ordered properties or patterns of stimulation which remain constant during movement of the observer or parts of the environment (Gordon, 1989: 157). These are divided into two categories; transformational and structural invariants. Transformational invariants reveal what is happening to an object, e.g. when moving at a constant speed away from an object its size diminishes at a constant rate (ibid.). Any change in this indicates that the movement rate has changed or the object is actually changing size (ibid.); other information in the optic array specifies which. Structural invariants are those patterns and relationships which remain constant despite movement; these indicate things such as size constancy, and rely on the regular transformation of objects and occluded texture on a surface (Gibson, 1986). It has been demonstrated that this texture gradient is also used to detect the distance to an object, both whilst stationary, and through an understanding of its lawful change, whilst moving (Reed, 1988: 82; Harris, 2014: 272). The final factors, which allows for distinguishing between passive and self-actuated movement, are proprioception (the detection of movement through proprioceptors in the muscles, skin and tendons) (Proske and Gandevia, 2009) and the vestibular system (Day and Fitzpatrick, 2005; Angelaki and Cullen, 2008). Witt and Riley (2014) formalised this information as part of their ‘extended global array’.

The importance of movement has been further demonstrated by Michotte et al. (1991). Through experiments into the completion of images and the perception of complete spheres (rather than just the facing half), they showed that completion processes are governed by the same laws of organisation as visible parts of the perceptual field; their perception depends upon the movement of the perceptual system (ibid.). This they conclude "demonstrates... the perceptual character of amodal completions... and excludes any attempt at an explanation
based on inferences or on the intervention of mental images” (Michotte et al., 1991: 165). This insight is very important, as the majority of objects in our visual field at any one time will be, at least partially, occluded. This offers an explanation as to why we continue to see these objects as complete entities. This idea is developed further in the work of Nöe (2004) discussed in Section 2.3.6.

Gibson argues that many illusions rely on static or monocular vision (Gibson, 1986), which he sees as an unnatural way of seeing; if illusions were perceived in the environment we would see them correctly (ibid.). Prime examples of this are the Müller-Lyer illusion (Fig. 2.3), and the Necker Cube, which if actually constructed, does not offer the same perceptual effects. As pictures are two-dimensional they also rely on static vision and therefore involve limited information (Wade and Swanston, 1991: 9).

Gibson asks whether misperception in the environment is a failure to pick up all the information available, or if it is possible that sensory information may contain misinformation (Gibson, 1986: 243). It would seem that illusion relies on misinformation, e.g. information that something is three-dimensional when it is not, and that misperception in the environment may be related more to a failure to pick up all the information available (Gibson, 1986: 244). Michaels and Carello (1981: 91) take this discussion further and state that misperception can occur both due to inadequate information being available, such as from fog blurring optical structure, and from failure to detect the available information, such as due to too low a sensitivity for dim light, or lack of attention.

Along with the concept of photograph-like snapshot vision, Gibson rejected the model of a retinal image, in part due to the nature of compound eyes found in arthropods. Their eyes do not contain a retina, and thus he argued the retinal image cannot be the basis of visual perception (Gibson, 1986: 62). Experiments with fiddler crabs have shown that they react to visual scenes in the same way as humans and other vertebrates; this cannot be explained by traditional optics (Gibson, 1986: 176). Ecological optics however, would account for this apparent unity in visual perception (ibid.). Many of the problems facing theories of visual perception, Gibson believed, were caused by starting from an incorrect model of the fundamental elements of vision.
Gibson was also particularly critical of indirect theories of visual perception, such as Psychological Empiricism and Probabilistic Functionalism, which rely on mediation of visual stimuli through preconceptions, hypotheses, expectations etc. (Gibson, 1986: 166). He believed that these theories relied on the assumption that observations made in the laboratory transfer directly to everyday, natural vision (Gibson, 1986: 168) and that they amounted to “we can perceive the world only if we already know what there is to be perceived” (Gibson, 1986: 246).

Another key aspect of Gibson’s Ecological Perception is that of affordances; “The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill” (Gibson, 1986: 127). Affordances are relative to the animal and thus refer to qualities both of the animal and the environment (ibid.). Again Egoreception and exteroception are inseparable (Gibson, 1986: 126). The basic affordances of the environment are directly perceivable without learning:

“If a surface is horizontal, flat, extended, rigid and knee-high relative to the perceiver, it can... be sat upon... If it can be discriminated as having just these properties it should look sit-on-able; if it does, the affordance is perceived visually.” (Gibson, 1986: 128)

This is one of Gibson’s best examples of an affordance and demonstrates that to perceive something is to perceive what it affords; its composition and layout constitutes its affordances (Gibson, 1986: 127). This implies not only that certain meanings of things in the environment can be directly perceived, but also that, in a sense, these are external to the perceiver (ibid.). Whilst affordances are an important element of Ecological Perception and are pertinent to cross-cultural considerations of visual perception, they do not form a key part of the theory’s explanation of how vision works, and so their discussion will be left until later.

The theory of Ecological Perception has a number of key strengths; many of its claims are backed up by scientific study and it tackles visual perception in natural situations, rather than in a lab. In addition, it allows for innate and learned aspects of vision, and it is applicable to all animals. It also allows for common perception of the world, whilst still taking into account the differences of each observer through affordances. For Ecological Perception, the environment is fundamentally a public thing. With the emphasis being on our physical relation
to the environment, mediated by invariable rules of change in stimulation, Ecological Perception could suggest that there is little cultural variation in visual perception.

Critics of Ecological Perception have questioned what is meant by direct perception, and how it is that we respond to the information contained in the ambient optic array (Gordon, 1989). There is also no explicit link to the physiology and functionality of the brain (Gordon, 1989: 174). Marr (1982) criticised Gibson’s approach to vision, stating that the detection of invariants is a very difficult processing problem, despite the ease which Gibson assumes. Marr’s background was in artificial intelligence and his criticisms stemmed from the inability to develop this ability in computers. One might argue however that an organic brain is very different from a computer, and a difficult task for one is often easy for the other.

Gordon (1989: 175), whilst an admirer of Gibson’s work, notes that he has a tendency to “define problems out of existence”. This is certainly true; the problems of motion perception, the stability of the world and compound eyes are all examples of this. However, Gibson’s argument that these are only problems if you persist in using the traditional model for visual perception is coherent. It is, in a sense, no fault of Gibson’s that his theory adopts a model of perception for which these are not issues.

It has also been argued that since individual perceivers add nothing to the perceptual input, there should be no way for perceptual experiences to differ from person to person, or from occasion to occasion (Michaels and Carello, 1981: 69). A possible answer to this problem is that people can attend to different information in the ambient optical array at different times, depending on their dispositions and needs at the time (ibid.; Michotte, 1991: 65). For example, in the well-known gorilla and basketball attention test (Chabris and Simons, 2010) participants only recalled information they were told they needed to pay attention to. Due to the large amount of information available in the ambient optical array at any one time, we are constantly selecting which information to attend to; we do not consciously see everything in our field of vision. Gibson (1986: 240) himself stated that perceiving is awareness of, not just awareness. When one considers the perceptual implications of affordances as well, especially from the view of Witt and Riley (2014: 1360), it is clear that in fact perceivers do add a considerable amount to their perceptual experiences.
A final problem facing Gibson’s work is that of misperception. Whilst Gibson discussed this issue, there are aspects which he left unconsidered. One such aspect is the hollow mask illusion (Fig. 2.6). This illusion is not a two-dimensional representation, and one can clearly see the circumstances of its production, yet still it persists. There would seem to be neither any reason for failure to pick up all the appropriate information, nor any source of misinformation. The only reason can be that our innate recognition of faces overrides the other processes at work. Michaels and Carello (1981) assert that much of what is considered to be a perceptual error is in fact nothing of the sort. This view, they argue, depends upon the presupposition of an end point to perception; a percept which in itself must be right or wrong (Michaels and Carello, 1981: 95). In Ecological Perception however, there is no endpoint; perception is a continual process and thus “no one moment must stand as the last word on pragmatic truth” (ibid.). Although objectively the perceiver may not perceive something correctly at any one time, this is part of a process of perception and action aimed at bringing about a positive outcome. Thus Michaels and Carello (1981: 96) conclude:

“the conventional criteria [for error] are irrelevant to an organisms’ survival. In so far as the purpose of perception lies in its effectiveness in motivating and guiding useful activity, such activity can be the only criterion for the success of perception. And if we take useful activity as one necessary condition for the continuation of animal life, the existence of life reflects the fact that animals’ actions have met and continue to meet the criterion of appropriateness.”

There are a number of problems with Gibson’s Ecological Perception then, but they are not insurmountable. The combination of sound reasoning and convincing experimental evidence make this the most compelling theory of visual perception discussed so far.

2.3.6 The Enactive Approach to Visual Perception

The Enactive Approach to vision emphasises the importance of bodily action for perception. Its primary claims are that perception itself is a way of acting, and that the world is made available through movement (Nöe, 2004). Due to the emphasis on the body, this approach rejects the idea that perception is a process in the brain; instead it is a “skilful activity on the part of the animal as a whole” (Nöe,
2004: 2). For Nöe (2004: 1), “[w]hat we perceive is determined by what we do” and “[t]o be a perceiver is to understand, implicitly, the effects of movement on sensory stimulation.”

Indeed there is experimental and medical evidence to suggest that bodily action is intrinsically linked to visual perception. Nöe (2004) discusses at length the experimental work of Kohler (1964), in which subjects spent long periods wearing glasses with distorting lenses. These lenses altered the light received by the eyes, so that light entering the left eye entered as though it were coming from an object on the right and vice versa (ibid.). Kohler describes the profound effect this had upon one’s ability to see:

“If a certain point moves along with me in the visual field, then some other point will infallibly move in the opposite direction, as if indicating to me in no uncertain terms that it is not the least bit bound by what the other points appear to be doing at the time... Nothing remains stable and the experience is so confusing that I am unable to detect what laws the transformations abide by... as soon as I move my body or my head, any object is apt to become smaller or larger, stationary or mobile” (Kohler, 1964: 65).

Nöe (2004: 9) describes this effect as experiential blindness, since it disrupts the “implicit knowledge of the ways movement gives rise to changes in stimulation.” The breakdown of the usual patterns of dependence between movement and stimulation do not result in “seeing differently, but failing to see.” (ibid.). The lenses result in incoherent information which is not usable in any practical sense. Just like the kittens in Eleanor Gibson’s (1969) experiment, ‘blindness’ comes not from a lack of stimulation, but a lack of understanding of the changes in that stimulation. Eventually subjects adapted in a series of stages, starting with sight overriding other senses, such that sounds from the left seem to come from the right for example, and ending with normal sight (Kohler, 1965). Once this occurs taking the glasses off has the same effect as putting them on originally had (ibid.).

Nöe posits that this “experiential blindness” lends a great deal of credence to the idea that perceptual experience depends on our ability to exercise “sensorimotor
knowledge” (2004: 10). It might be argued that the adaptation process is one of learning the new patterns relating movement and stimulation. As with Ecological Perception, sensory stimulation is not enough to constitute a perceptual experience; “for [sensory stimulation] to have genuine world-presenting content- the perceiver must possess and make use of sensorimotor knowledge.” (Nöe, 2004: 10). This sensorimotor knowledge can be seen as equivalent to knowledge of Ecological Perception’s invariants. It is worth stressing again that this knowledge is considered to be implicit in the act of perception, it is not a cognitive task. Given this and its inherent link to the body, it might be better thought of as a learned skill rather than knowledge.

The importance of movement is attested to by other research as well. Gregory discusses the case of S.B. who was blind from a very young age, but later had an operation to restore his sight. Despite this he could not always perceive objects properly; he could see them but did not understand what he was seeing (ibid.). In order to properly perceive visually S.B. would first need to feel an object (ibid.); he had never learned the visual sensorimotor knowledge, so needed to link his existing touch sensorimotor knowledge to vision. Similarly there is the Titchener illusion (Fig. 2.7); in this illusion both inner circles are the same size, but the left one is visually perceived as smaller. When a subject is asked to grab either of these objects however, they do so correctly (Gregory, 1998: 160), demonstrating that perception involving bodily action is more accurate than when simply cognitive.

![Figure 2.24- The Titchener Illusion. Both central circles are the same size however the context of the outer circles alters our perception of their size.](image-url)
Witt and Riley (2014) discuss a broad range of evidence which shows that perception is directly related to the actions one is performing. Although they argue against it, invoking the global array, Witt and Riley (2014) suggest that this could be used to claim that perception cannot be direct, as Nöe and Gibson suggest. However, these examples show that perception is physically mediated, as opposed to mentally, and this is entirely coherent with the Enactive Approach’s sensorimotor knowledge and Ecological Perception’s invariants.

Much like for Gibson, Nöe’s starting point was the inadequacy of the snapshot conception of vision, about which he raises additional concerns. Some theories highlight the importance of the brain processing data in order to allow vision; a prime example of such processing is the idea that the brain fills in the blind spot with data (ibid.). These approaches often imply the creation of internal representations or models of the world, formed from processed sensory input (ibid.). Nöe (2004: 46) argues however that these theories commit the homunculus fallacy; the idea that there is, figuratively, a little man in the head looking at what we see. Our consciousness is portrayed as an observer of our bodies sensory input. Instead, he suggests that we let the world serve as its own model (Nöe, 2004).

For Nöe (2004) a more likely explanation of our lack of awareness of the blind spot is simply that the brain ignores it; the brain records a scene as a whole, ignoring the area it is not receiving any stimulation from at each moment. This may be a more valid explanation of the effects experienced when investigating the blind spot; if the brain assumes a complete and regular scene without any processing, we might expect to perceive a broken line as unbroken when the gap is positioned within our blind spot. If our brain processed the data it received we might also expect this, unless we consider past fixations, in which the break was evident. Instead, we would expect the brain to process the data accurately, and represent a broken line. The same can be said for a pencil tip; whilst the line is seen as unbroken, the tip of a pencil appears and reappears as it moves in and out of the blind spot. We know that it is still there, past fixations and knowledge from other senses can attest to its presence, but we do not perceive it. The brain ignoring the blind spot can account for these differences, the idea of filling in the
gap cannot. This view of the world serving as its own model, without any mental reconstruction, is a clear break from traditional approaches to visual perception and ties in closely with Gibson’s ideas on direct perception.

It has already been noted that perception is attention dependant; for Nöe this shows that we are not consciously aware of the character of vision. If at an unconscious level we adhered to the snapshot conception of vision, he argues, we would wonder why we need to continuously redirect our attention (Nöe, 2004: 58). Instead, we are not surprised by the lack of detail immediately available to us or the need to refocus our attention; we lean, squint and move our eyes, head and body instinctively to better see the environment (ibid.).

For Nöe, the reason many visual theorists fail to comprehend these issues is that perceptual experience is transparent, “[w]e too readily describe the world we see, rather than the world as seen” (2004: 49). These objections, along with those of Gibson, amount to a strong case against the retinal image based, snapshot conception of vision commonly adopted.

The Enactive Approach implies a unity in visual experience between different individuals, since we all move in a similar way. This similar movement, combined with the lawful way in which our movement changes what is visible to us, would likely result in a similar body of sensorimotor knowledge in all members of the same species. Animals with very different body types may perceive differently, though the rules of interaction between movement and visual stimulation should remain the same.

The Enactive Approach to vision is direct and non-inferential; through encountering the way in which scenes vary with movement, we directly encounter how things are (Nöe, 2004: 84). For Nöe, vision is very much like touch; by feeling an object with our hands we come to understand its structure, and how this influences our movements and sensory stimulation (Nöe, 2004: 73). A blind person does much the same thing when navigating an environment;

“Think of a blind person tap tapping his or her way around a cluttered space, perceiving that space... not all at once, but through time, by skilful probing and movement” (Nöe, 2004: 1).
According to Nöe (2004: 73), vision acquires content in much the same way, through skilful, active visual probing of the world over time.

Nöe (2004) also adopts Gibson’s theory of affordances due to their importance for an individual’s potential for movement. He thus states that perception involves identifying affordances, the possibilities for movement, and the structure within sensorimotor contingencies (Nöe, 2004: 105).

The Enactive Approach shares a number of strengths with Gibson’s ecological approach; it removes the problem of perceiving movement and allows for perception in other animals. It also explains our ability to perceive and interact effectively with our environment. There are, however, issues which might be raised with Nöe’s theory. For Nöe (2004: 202) there are two types of perceptual content; factual content presents how things are, perspectival content presents how things are from ‘here’. It might be argued that his emphasis on subsequent vantages only allows for the latter, however, Nöe (2004: 205) makes it explicit that perception presents how things are because we understand the relation between this and the changes in the way things appear as we move.

Using the example of a sculpture made to look like a Penrose triangle, Matey (2013) has argued that sensorimotor knowledge cannot account for amodal completion. However, her arguments rely on static views and the idea that a shape must be experienced before it can be properly perceived. The former is precisely what the Enactive Approach aims to move away from, and the latter is a misunderstanding of sensorimotor knowledge. To have to fully experience every shape before one can properly perceive it returns to circular reasoning of some indirect theories. In actual fact, sensorimotor knowledge is general, it relates to how what we see changes through invariable rules as we move. Although different shapes may change in slightly different ways as we move, the underlying rules are the same, and a few general shapes will be broadly applicable. To take a practical example, one may never have seen a dodecahedron before, but would not be confused when first seeing a D12 die.

Much like Gibson’s theory, the Enactive Approach has low neurological validity, it does not refer to brain structures and processes. It also does not give a full account of vision; it describes in depth how we learn to make sense of our environment and interact with it through bodily action, but it does not address how we actually see. This leaves it rather
incomplete as an account of visual perception. The Enactive Approach cannot be seen as a complete perceptual theory then, but could be of great use as an addition to other theories of perception.

2.3.7 Sense-Datum Theory

Sense-Datum Theory, an indirect theory of visual perception, has been espoused by many philosophers since the 17th century. It posits that when we see an object in the world, for example a tree, what we are in fact directly aware of is a “tree image” in the mind, rather than the tree itself (Robinson, 2001: 1). This is contrary to what Robinson (2001) refers to as pre-philosophical naïve realism, often referred to as direct perception, in which what we perceive is deemed to be mind-independent. These mental images are variously known as qualia, sensum or sense-data and are defined by Robinson (2001), one of the modern proponents of the theory, as having the following properties;

1) They are something of which we are aware
2) They are non-physical
3) Their occurrence is private to a single subject
4) They possess sensible qualities such as shape, colour, texture etc.
5) They possess no intrinsic intentionality (it may suggest to the mind other things beyond it, but its qualities in themselves do no not refer to anything else)

These sense-datum are caused by, but are not intrinsic to the nature of, objects in the world, (Robinson, 2001). The rationale is that objects always look different from the way they actually are; looking different shapes from different angles, appearing different colours under different illumination etc. (Moore, 1918: 20-22; Robinson, 2001: 31). It is thus argued that what we are aware of cannot be the object. The main concept of the Sense-Datum Theory then is that we are not directly aware of the world, but of sense-data. This puts the theory in direct opposition to a number of the theories already examined. The concept is best described by Broad’s (1976: 89) ‘phenomenal principle’;

“Whenever I truly judge that x appears to me to have the sensible quality q, what happens is that I am directly aware of a certain object y, which (a) really does have the quality q and (b) stands in some peculiarly intimate relation, yet to be determined, to x.”

71
Robinson (2001: 41) next proposes that the existence of convincing hallucinations, reflections and fakes, all attest to the existence of sense-datum, since the thing which you are aware of does not have the same properties as the physical object. The “argument from illusion” continues that there is such overlap between cases of illusion and veridical perception that the same analysis must apply to both; therefore, in all cases of perception we are aware of something other than the object we purportedly perceive (Robinson, 2001: 57).

The argument from secondary qualities asserts that physical objects have both primary (size, shape and number), and secondary qualities (colour, odour, heat, texture etc.) (Robinson, 2001: 59). The latter are not intrinsically possessed by objects, but objects have a disposition to produce the qualities in us, through sense-data (ibid.). It is not made clear how this disposition differs from the actual possession of these qualities, but it is asserted that science shows the original premise to be true, since secondary qualities do not figure in any scientific account of the world; therefore, without perceivers these qualities would not exist (Robinson, 2001: 60). Robinson (2001: 74-79) goes further still, stating that all qualities other than location are in fact “creatures of perception”, since no objects appear as they really are; nothing is really smooth, straight or the shape it appears even if it appears to be so.

The Sense-Datum Theory and Robinson’s defence of it have a considerable number of problems, some of which seem to be the result of a misunderstanding of scientific ideas. First, one might take issue with the phenomenal principle and ask why there is need to infer an extra step in perception. Robinson (2001: 32) applies Leibnitz’s Law but we might equally apply Occam’s razor; sense-data is an unnecessary abstraction. There is also no explanation for how sense-data are related to objects in the environment. From the start, they seem to be unexplainable and unnecessary within the perceptual process.

In response to Moore’s (1918) account of perception, one might adopt the position of Gibson (1986) and Nöe (2004), arguing that although an object may look different ‘from here’, we still perceive it correctly, in part due to our knowledge of movement and what ‘from here’ means for our perception.

The argument from illusion is also problematic. Firstly, it is illogical to suppose that the object of perception has different qualities from the thing which we deem ourselves to be
perceiving; the qualities are the same, but the observer is misperceiving them. This is subtly different, but the difference is important in this case. It is not in receiving information that the error occurs, but in understanding that information. This may be due to incorrect usage of contextual information, such as the Müller-Lyer illusion (Fig. 1). On top of this, as is noted by Gibson (1986), illusions are generally caused by abstracted laboratory experiments or two-dimensional images, and thus are not representative of normal perceptual conditions. In full ambulatory perception misperceptions are less common, though vision can be fooled in ecologically valid conditions, especially where movement is restricted, such as in the Ames Room, in which a distorted room leads to incorrect size perception. However, just because it is possible that the perceptual system can be fooled, it does not mean that we do not perceive the world. Michaels and Carello (1981) noted that the concept of misperception in the real world relies on perception being a process with a distinct end point. It is also of distinct importance that these misperceptions are in fact caused by the sensible qualities of the objects themselves and the context they are in. Thus it is the sensible qualities which are directly causing an observer to misperceive these qualities; there is no need to posit an additional entity to explain this.

Robinson’s (2001: 41) comments about reflections, fakes and hallucinations are equally problematic. Although the reflection itself is not the origin of the qualities perceived, to say that it does not have the same visual qualities as the thing being reflected is patently fallacious. If this were so, the reflection would have no reason to look like the object reflected. Equally, whilst a fake may be mistaken for the real thing, the entire reason that this works is because it has visual qualities which are like those of the object, even if they are produced in a different way. Just because we are fooled by these convincing duplications of qualities, it does not mean that we do not perceive the qualities of the object. It is precisely because we do that the fake works. Robinson (2001) writes as if objects such as tomatoes have the visual quality of ‘tomatoness’, and as other things can possess this visual ‘tomatoness’ it cannot be a property of the objects themselves. This is of course not the case; there are a number of different qualities which give the sense of a tomato, shape, textures, colours etc., none of which are exclusive to tomatoes. If an object were to have all the qualities of a tomato, visual and otherwise, then of course it would have to be one, but that all is required for a fake in
this sense is a visual facsimile, and sharing just some of a tomato’s qualities whilst not being a tomato is entirely unproblematic.

Equally, the problem of hallucination is misrepresented; for Robinson (2001) actual perception and hallucinations are both caused directly by brain states which could in theory be identical. This is evidently not the case however; one has its cause in actual stimulation from the environment, the other is entirely internal. Hallucinations are purely mental and bear no relation to light entering the eye; there is nothing in the environment to be perceived. As Locke (2002: 111-112) argued, we can either allow that things which are alike are in fact ontologically distinct, or assert that we do not perceive objects in the environment; “There seems no good reason for accepting the second alternative.” All of these conceptions seem to rely on the homunculus fallacy Nöe (2001) discussed; the brain is conceived as producing a mental image to be seen by the consciousness.

The assertion that secondary qualities are not intrinsic to objects is also based on questionable arguments. The theory asserts that these qualities are entirely based within us, but even if no perceivers existed, objects would still reflect and absorb different wavelengths of light, there would still be vibrations and chemicals in the air and objects would still have varying qualities including hardness, roughness etc. Our senses are ways of detecting the properties of the environment.

Robinson (2001) confuses cause and effect in perceptual matters repeatedly, for example, asserting that colour affects which wavelengths of light are reflected by an object, and then that there are no natural laws which correlate certain surfaces to certain colour qualities (Robinson, 2001: 67). Following his reasoning through, one is left with a situation where one’s own perception of what colour an object is affects what wavelengths of light are reflected by said object! It is of course the case that the object reflects certain wavelengths of light which our eyes detect in a lawful manner as certain colours.

Contrary to Robinson’s (2001) claims, secondary qualities are a key aspect of science, and clearly exist beyond our perception; they have consequences beyond our experience of them. Peter Hacker (1987: 139) asserted that secondary qualities are irreducible and causally active;
the fact that white things stay cool, and black things warm up in the sun shows that colour is an active quality, explained by the structure of the objects’ surfaces.

Moore (1918) and Robinson (2001:65) also misrepresent colour perception being affected by what other colours are being presented at the same time. Figure 2.8 shows this effect; although each coloured spot on the chequered board looks to be a different colour they are in fact the same. This is caused by the lighter spot appearing to be in shadow, when it is not. The light information conveys that both spots are the same colour but that one is in shadow, as such one must actually be lighter in order to give off the same intensity of light. This is however an illusion; figure 2.9 shows the second spot as actually in shadow, whilst figure 2.10 shows the intensity of the effect of this illusion.

Despite the spot in shadow in Figure 2.9 clearly looking darker, most people would accurately gauge the spots to be the same colour in a natural scene. So whilst it is true that context affects how we perceive colours, this generally works only in artificial, impossible representations. In real world scenes we experience the difference in colour caused by varying illumination and background colour but can accurately gauge the correct colour; this is colour constancy.

![Figure 2.25- The spot in shadow appears to be lighter than the other. The overlapping spots on the right show their actual colours.](image1)

![Figure 2.26- The spot in shadow now appears to be darker as it is genuinely in shadow. The overlapping spots on the right show their actual colours.](image2)
Finally, with regard to all properties being secondary, it is true that objects are not exactly as we describe them; they do, however, have these properties for a given sense of the word. The issue here is one of scale or degree. A smooth surface is in fact rough at a microscopic level, but much less so than one which is evidently rough. At the point where our senses are no longer able to detect variation we cease to differentiate. Just because in everyday experience our senses are not sensitive enough to perceive these qualities, it does not mean that they are not a part of the objects themselves. Robinson (2001) assumes that our everyday practical descriptions of things must hold to be perfectly true if they are to be true at all, when really this is not necessary. A thing being true for a given practical tolerance is perfectly adequate.

The Sense-Datum theory suffers from a host of problems, not in the least that it often resorts to assumption and unsubstantiated claims. As a longstanding and much adopted theory of perception it needed to be addressed, however, it cannot be considered valid.

2.3.8 Extended Cognition and Perception

Active Externalism and the Extended Mind Hypothesis treat cognition and perception as a process not bound by the limits of the brain. Both have been applied to archaeology by
authors such as Malafouris and Renfrew in the study of material culture (Malafouris and Renfrew, 2008; 2010b). The Extended Mind Hypothesis begins with the familiar assertion that the separation of mind, body and culture is purely for conceptual purposes; they have evolved together and can only exist as an inseparable unit (Malafouris, 2010a: 264). Thus Malafouris (2010a: 264) asserts the need to develop methods for understanding the reciprocal interaction of brain and culture in order to better understand human action. For Malafouris (2004: 57) any approach to human cognition must be embodied, situated, extended, enacted and mediated. The relationship between people and the world can therefore be considered as one of direct ontological inseparability (Malfouris, 2004: 58), to the extent that external stimuli may be considered part of the cognitive mechanism itself (ibid.).

The concept that things external to the brain-body system can play a role in mental processes lies at the core of the Extended Mind Hypothesis. The best illustration of this idea is the blind person and their stick; they are in fact using a part of their environment in their navigation of that environment. Malafouris (2008a: 403; 2010b: 15) asks whether we should draw the boundary of the cognitive system which allows the blind person’s locomotion at the skin, as is often assumed, or the tip of the stick (ibid.). Without the stick they cannot navigate, and so it is clearly part of their navigational system. The blind person senses the presence or absence of objects in the environment, not the stick itself (Malafouris, 2008a: 405); it becomes transparent through familiarity. In a very real sense, the stick serves to extend the range of the blind person’s sense of touch, becoming an integral part of their perceptual system. As Tylén and McGraw (2014) assert, it is not form or location that defines something, but function.

Beyond this, Clark and Chalmers (1998) posited that reliance upon the environment to support cognition is the norm, for example, we regularly use a pen and paper to aid in maths, or rearrange tiles in a game of scrabble to aid word recall (ibid.); this is Active Externalism.

The Extended Mind Hypothesis talks mainly about the influence of the environment on the brain, and the brain’s use of the environment to assist normal processing, whilst Active Externalism talks about extending parts of the mind out into the world.
The root of Active Externalism is the parity principle; if the environment plays a role which, were it done in the head, would be considered as part of the cognitive process, then it should be considered as part of that process (Clark and Chalmers, 1998: 8). Since it works in much the same way as the mind in isolation, with both mind and environment playing a causal role, they argue that this coupled system should be seen as a cognitive system in its own right (ibid.). Clark and Chalmers (1998) spread this concept beyond extended cognitive processing to an actual extended mind; not only can parts of the environment aid in processing, but they can take on the role of parts of the brain. Their chosen example is an Alzheimer’s disease sufferer, Otto, who constantly refers to a notebook to remember things (Clark and Chalmers, 1998: 12-16). He functions in the same way as anyone else, they argue, except he looks to his notebook for stored information, not his brain (ibid.). His memories are literally stored externally, since he lacks the capacity to do so internally, but they are still used in the same way. Thus part of his mind is external to his body (ibid.). Such coupled systems can also form for healthy individuals, reducing cognitive requirements and increasing efficiency (Tylén and McGraw, 2014).

Later work on Active Externalism has added additional qualifiers for cognitive coupling, including that the external element be typically invoked, that it be automatically endorsed (i.e. any information provided is accepted without question or it is accepted that it is improving efficiency) and that it is easily accessible (Clark, 2012). Sutton (2012) describes this approach as ‘first-wave extended mind theory’, which the second-wave sees as too limiting. Second-wave theory is based on the complementarity principle, which states that external processes need not mimic inner ones, but can play very different roles and have different properties, provided that they aid in thinking and acting (Menary, 2012; Sutton, 2012). Indeed one might see it as beneficial that they are different from internal processes since they can offer new opportunities. This opens up far more opportunities for coupling in the day to day life of healthy individuals, and not just individuals like Otto.

If we allow the blind person their stick and the Alzheimer’s sufferer their notebook, then the rest of our material culture can also be seen as an extension of the “human self-system”, and fundamental to our development (Malafouris, 2008b: 1997-1998). In short then, the content
of mental states is in part determined by the external environment, and parts of mental processes can take place externally (Malafouris and Renfrew, 2010b: 5).

2.3.8.1 Cognitive Neuroscience and the Extended Mind

The development of neural imaging techniques has allowed the exploration of the idea that the brain is an adaptive, environmentally contextual system (Malafouris, 2010a: 267). Malafouris (2008c: 383) asserts the importance of neurology for archaeology by reminding us that the brain is as much a part of human interactions with the environment as the body; if we are to understand such interactions we must look at the whole system. At this time however, there remain considerable obstacles to developing cross-cultural neuroscience (Malafouris, 2010a: 264, 270).

It has been shown that functional and structural changes to the brain occur throughout a person’s lifetime, caused by our ordinary engagement with the world (Malafouris, 2010a: 268). Malafouris (2008a: 401) asks whether we can assert that using particular material culture can change the brain; certainly there are examples of particular activities changing the structure of the brain (see Amunts et al., 1997 and Maguire et al., 2000). This has major implications for archaeological research, ranging from differences between the brains of groups using different material culture, to the development of new forms of material culture (such as the emergence of tools). Indeed Clark and Chalmers (1998: 11) state that our brains have evolved in ways which factor in the reliable presence of external cognitive aids to reduce memory load and transform the nature of computational problems. Unfortunately, the technical requirements of neuroimaging mean that study of action is limited, and embodied approaches to cognition cannot yet be explored (Sporn, 2010: 59).

More recently Malafouris (2013) has argued that neurological plasticity invalidates the view that brain function has remained much the same since the emergence of anatomically modern humans. However, whilst it may be true that our brains adapt to our current context, and that such development may have offered an evolutionary advantage, genetic evidence suggests that our brains start from much the same point, to suggest otherwise, as Malafouris seems to, would be to adopt a Lamarckian view of evolution.
Extended mind and neural plasticity have bearing on the question of cross-cultural perception; people could be born with equivalent perceptual systems which might then diverge through different experiences. Tang et al. (2006) have shown that different linguistic and cultural experiences can result in distinct patterns of brain activity during mathematical processing; might this extend to perception as well? There are currently two contrasting views on neural plasticity; the neural exploitation hypothesis claims that adapted brain mechanisms keep their original functions, whilst the neuronal recycling hypothesis suggests the transformation of no longer useful architecture for a different use (Malafouris, 2008a: 403). It is possible that in the future, cognitive neuroscience may be able to offer clear answers to questions about perception in different peoples, the effects of interaction with different material cultures, and the importance of embodiment, but for now it can only supply us with interesting possibilities for the effects of culture and activity.

2.3.8.2 Critiques of Extended Mind

The concept of extended mind has been criticised by arguing for differences between the internal and external through multiple methods. Firstly, it is argued that real cognition remains in the head because it is portable and always available to use on a task; coupled systems are too easily decoupled (Clark and Chalmers, 1998: 10). Clark and Chalmers (1998: 11) assert, however, that as long as a system of coupling is regularly available when it is needed, that is enough. The possibility of loss or damage equally affects the brain; it can lose capability through intoxication, emotion or damage (ibid.).

The second way of asserting differences is based on certain attributes or processes that are evident in the brain but not in extended minds. This includes primacy, recency and chunking effects in memory, which Adams and Aizawa (2001) argue are only present in internal memory stores. Similarly some argue that the use of internal versus external resources is so dissimilar that any assertion of parity must fail (Adams and Aizawa, 2001; Clark, 2012). Of course the complementarity principle demonstrates that these differences may in fact be useful. Wheeler (2012) goes into some detail on the problems of using the parity principle to argue against extended minds, concluding that location cannot determine what is cognitive. In addition, Clark (2012: 53) notes that the criticisms deal with external elements as if they must constitute a cognitive system in their own right, rather than part of a greater system.
A further criticism levelled at extended approaches is that although external elements can be co-opted into cognitive processes, it is always the brain that has the final say (Clark, 2012: 54). This certainly seems to be the case, but Clark (ibid.) argues that this does not dictate what is and is not part of a cognitive system; this view relies on a falsely supposed unity of the brain, which in actual fact it is subdivided into different areas with different roles. If the final say is only the responsibility of one part of the brain, is the rest no longer part of the mind (Clark, 2012: 55)? Memory is not part of final decision making even though it may be called upon to retrieve information relevant to the decision, but one would not say that it is not partially constitutive of the mind; the same could be said for Otto’s notebook (ibid.). There must of course be meaningful distinctions between person and world, otherwise the concept of personhood becomes meaningless, but there seems to be little reason to suggest that parts of the world cannot be temporarily used to extend the cognitive system. Perhaps the key distinction is intention, we intend to use the notebook or the pencil to aid cognition; they do not intend to use us.

It is likely the failure to identify that there must be such a distinction in much of the literature that leads to Adams and Aizawa’s (2012) argument that external objects cannot be cognitive since alone they have no “mark of the cognitive”. They admit that there is no established theory for what constitutes this but they assert that all the evidence points to anything that is recognisably being cognitive only existing within the head (Adams and Aizawa, 2001; 2012). Of course given the limitations of cognitive experimentation noted by Sporn (2010) it is not surprising that they find limited evidence for extended cognition.

Throughout their work Adams and Aizawa (2001; 2012) deny the possibility of multiple realisability; that the same cognitive outcome can be derived from different processes. However, functional convergence, the evolution of a particular function through multiple independent lineages and usually through different underlying mechanisms casts doubt on this assertion (Wheeler, 2012: 205). Richardson et al. (2010) argue that the assertion that cognition must be bound by the head is a symptom of tendencies to adopt ego-centric views of the world. This can lead to the kind of straw man argument that Adams and Aizawa (2012: 75) put forward, privileging the functionality of the brain; DVD players, radios, televisions etc. are all information processors, but they process information differently from the brain and
therefore, they argue, are not capable of facial recognition, driving cars, linguistic processing etc. But of course none of their examples are designed to perform these tasks, whilst the brain has evolved to do so. There are electronic systems which are capable of performing such tasks, and their abilities are being improved all the time. The tasks are performed differently, but the end result is the same; these are clear examples of multiple realisability in a completely non-organic context. To what extent these may be considered cognitive is up for debate, but it demonstrates that things external to the brain can perform what are explicitly cognitive tasks when performed inside the head. To what extent these external processes are truly independent from human intent when actually active is also debateable, but their existence would suggest there is no problem with theorising coupled biological and non-biological systems.

A final common critique of Active Externalism is cognitive bloat (Ludwig, 2015). Ludwig (2015: 355-356) argues that the criteria that distinguish cognitive from non-cognitive processes do not prevent an explosion of dispositional beliefs and knowledge caused by access to things such as Google or Wikipedia. Whilst the criterion of past endorsement is not met, Ludwig (2015, 358-359) argues that this cannot be accepted as part of Active Externalism anyway and so is irrelevant. For Ludwig (ibid.) this would mean that Otto would forget the information in his notebook if he were to switch to a mobile phone, even though the same information was available. With this criterion gone, any piece of information on the internet becomes something which a user has knowledge of in their extended cognitive system (Ludwig, 2015: 360). Ludwig (2015: 364) asserts that there is no framework which can maintain the concept of endorsement and delimit what information one does and does not know through one’s access to the internet.

The framework which Ludwig fails to identify is actual behaviour. The internet, or indeed any information source, including our memory, is in fact a source of potential information; information is never immediately at hand, it requires retrieval. Sometimes this retrieval is very quick, sometimes it is involuntary or subconscious, but the information available to us is not all present at all times. Were this not the case we would never have to think about something to remember it, and we would never fail at recall; information in our memory would always be there the moment we required it. With this in mind, our actual knowledge
does not explode with the use of the internet, only our potential knowledge; our actual knowledge at any one time only constitutes what we access. Internal and external information stores are therefore quite similar in nature, it is just that external stores, for now at least, generally require some form of physical interaction to use; though biological memory recall can be aided with and even fail without physical acts too.

This approach means not knowing things that are in our memory which are not currently being used, only potentially knowing them, but for the purposes of explaining cognition and behaviour this is not a problem. Whilst I am putting up a shelf, any information stored in my memory about German vocabulary is irrelevant to my behaviour, therefore it is not accessed and is not current in my mind as knowledge. Only when the situation changes to require this knowledge do I access it and make that knowledge current. Our brains can only process so much information at one time, and to posit that all of our memories are imminent in our brains would surely be placing an unnecessary cognitive burden upon them.

One can also counter Ludwig’s endorsement argument through behaviour. In switching from a notebook to a phone, Otto uses a different information store, and although he has not put the information there, we can ascertain his endorsement of it by his use. Indeed any person who acquires information, no matter the source, does not endorse it simply by virtue of it being in their memory. I may remember directions offered by a friend, but it does not mean that I necessarily endorse them, they are only endorsed by my conscious confirmation, unfailing trust in the source, or my intention to use them. Again, actual behaviour is the determining factor.

It would seem that many of the criticisms levelled at the concept of extended mind fail to disprove it. Certainly there is limited neurological evidence for Active Externalism at this time, leaving the argument a largely philosophical one, but this is perhaps a matter of experimental design limitation. There is increasing evidence for neurological change being linked to activity however, and it seems to be perfectly reasonable to suggest a coupled system of brain and environment, at least until neurological evidence shows otherwise.
Hurley (2001) advocated the importance of the environment in perception, primarily as a response to Gibson’s Ecological Perception, and Behaviourism. For Hurley (2001: 6), the perceptual system is based on a dynamic feedback loop, in which action affects the input, in turn guiding further action; this necessarily includes the environment. This link between action and perception is supported by neurological evidence and is contrary to behaviourist accounts, in which such feedback is ignored (Hurley, 2001: 12-14). Hurley (2001) criticises Gibson for giving passive movement a role equivalent to active movement in his theory (thus suggesting that feedback loops are not involved in the perception of movement (Gibson, 2002: 78) and for rejecting notions of mental processing. Instead internal and external feedback are said to play complementary roles in perception and action (Hurley, 2001: 14-15). Internal feedback consists of copies of efferent signals (motor commands) and external feedback is the effect of movement on the perceptual field (Hurley, 2001: 21). Whilst for Gibson, external information from the transformations and invariants in the ambient optic array are enough to distinguish self-movement from environmental movement, Hurley asserts that the comparison between reafference and efferent signals are needed (Hurley, 2001: 21-22).

Reafference is input which gives information about an organism’s own movement, including visual and proprioceptive input, whilst efference copy is a copy of motor signals sent to perceptual areas of the brain (Hurley, 2001: 23). The relationship between the two gives information about both the self and the environment, and whilst often redundant, Hurley (2001: 23-24) believes that this is necessary to explain the adaptation of the visual system to things such as reversing goggles. Whilst wearing them reafference and efference copy give different information; once adapted so as to correlate again, normal vision returns (ibid.). Efference copy seems redundant however, even in this situation; whilst one aspect of reafference, visual input, is giving one set of information about your movement, proprioception will be giving different, correct information. With the knowledge of what you wished to do, and the proprioceptive feedback confirming that you have in fact taken this action, the only disparity comes from visual feedback. It is logical then that the lone discrepancy will be the aspect of the perceptual/motor process which is adapted to suit the
new situation. It may be the case that if a situation was engineered in which either motor commands or proprioception held the discrepancy they would be modified instead, or that if all three of them were in disagreement adaptation to the new perceptual situation would be impossible. By accepting the role of proprioception many of Hurley’s objections to ecological views of perception, including the issue of passive movement cease to be a problem.

The most important thing to take away from Hurley’s discussion of motor and control theories of perception is that our perceptual/motor system controls input, not output (2001: 25). Action causes a change in the perceived environment, the same change can be generated by different actions and the same action can generate different disturbances, depending on the state of the environment. Consistent results are gained through motor control based on input; in other words, action is altered in response to feedback (both external and proprioceptive), in order to produce the correct result (ibid.). This is much like Gibson’s emphasis on the flow of the optic array and the transformation of invariants. In this way, the environment is a fundamental part of the perceptual system, the feedback it offers allows the development and appropriate functioning of both perceptual and motor systems. Much in the way that Malafouris, Clark and Chalmers posit cognition extended into the environment, we can posit perception and the control of action are likewise part of an extended coupled system.

2.3.9 Electronic Approaches to Understanding Human Vision

The development of vision in computers, robots and AI systems is a fast developing field but it is not the current technology which is of interest, so much as what comparisons to computer approaches can tell us about human vision. An early and influential proponent of using the understanding from computers was Marr (1982), who proposed that the brain divided objects into cylinders at different scales in order to recognise them. An arm may be represented as a single cylinder for example, but at a finer scale of recognition it would be made up of smaller cylinders representing the upper and lower arm, the hand, and so on. This was further developed by Biederman (1987) who proposed a set of geometric icons, or geons, of different shapes which together could form a range of generalised shapes. Such structural-description theories stem from positing that the brain recognises objects similarly to the way that a computer creates them, but as noted earlier, brains and computers may operate quite
differently, certainly they have different architecture. The reduction of recognition to such basic forms poses problems for distinguishing between similar objects for example, yet a human can easily distinguish between a box and a book of the same size and shape (Wolfe, et al., 2015).

Clark (1989: 75-76) questions the effectiveness of the classic methodology of building AI which involves breaking problems down into separate areas of study with the hope of recombining them later into a useful understanding of human cognition. One could make similar arguments about approaches to the physiology of perception, which tend to focus on one small process. Clark (1998) has therefore called for divisions between perception, cognition and action to be removed.

In attempting to understand perception, Clark (1998) described a number of robots which, rather than taking a representational approach, operated according to a number of rules in responding to input from the environment, without any central control. These simple rules lead to “functional creatures” which Clark (1998: 14) suggests are a plausible model even for complex brains. An example is Herbert, an office drink can collecting robot (ibid.). Rather than generating an internal map and then planning a route, which would be computationally costly and rely on a stable environment, a series of simple, largely independent, behaviours are coded so that they are enabled in response to certain stimulus in the environment (ibid.). Through this method, complex, robust and real-time behaviour emerges without any central control, unlike AI systems that rely on data stores and computational power (Clark, 1998: 14; 54-59). This approach could be seen as an example of embodied AI, and so perhaps more like biological systems. More complex solutions meanwhile may only be partially programmed for in an advanced organism, allowing for central control (ibid.: 152; 160).

Whilst Clark (1998: 60-62; 148) supported an embodied approach and the importance of external scaffolding, he rejected the “thesis of radical embodied cognition” which discards representational, symbolic or computational approaches, and which some extended mind approaches fall under. Instead Clark (1998: 149; 167) argues for local and action oriented internal representations, which in certain situations, such as reasoning about absent states, or identifying valuable items in a room, are the most appropriate perceptual explanation. However, the former is not in fact perception, it is thinking, whilst the latter is a higher order
perceptual task that relies on prior knowledge, and there is no need for an internal representation to apply that knowledge. It would seem that in actual fact, Clark’s (1998: 169) idea of internal representation might be better classified as signal response mechanisms/processing within the brain, rather than the literal internal representation advocated by many other approaches.

Since the robotics experiments discussed by Clark, there have been advances in robot navigation made through machine learning (Bagnell 2010), which further suggest that an adaptive solution is more appropriate than large data stores and pre-programming. These systems could be seen as computer based embodied learning of the sort Nöe proposed, though they are still some way from organic solutions. Whilst attempts to understand human vision through abstracted electronic approaches have failed to successfully describe how we perceive, or create adaptive functional systems, embodied computer approaches have been more successful, suggesting the importance of embodied action for perception. This may give us clues about the nature of perceptual development, but ultimately, the criticism that the architecture and processes of a brain and a computer are vastly different stands.

2.4 Summary and Archaeological Implications

This chapter has analysed a range of theories covering the main approaches in perceptual literature. Whilst some have been purely philosophical in nature others have been based in experimentation and observable effects. This distinction crosses traditional borders of perceptual theory, e.g. realism vs idealism and internalism vs externalism. This means that each general approach can be assessed on equal grounds, even if each theory may be presented differently by its proponents.

Phenomenology is undoubtedly the most used perceptual approach in archaeology, however this chapter has demonstrated that through focusing on thought experiments and not the actual workings of perception, it fails as a perceptual theory; instead it is more of a conceptual tool. Whilst one might argue that it has its uses, its drawbacks for the advancement of archaeology as an empirically realist enterprise are perhaps far greater. Even some proponents of phenomenology argue that the nature of perception makes it impossible to have the experiences of someone from a past society (Eve, 2014: 17). For such individuals,
landscape archaeology does not allow us to analyse the experiences of past people, but instead offers the opportunity for modern people to analyse their own experience of landscapes (ibid.). For others, the question of to what extent we can suppose a common perception of the landscape between past and modern people is almost irrelevant, since they start from an assumption of parity. All of this amounts to a theory which is of little use for the purposes of this thesis and the advancement of archaeological epistemology.

Of all the approaches, idealism’s conception of perception seems to be the most at odds with observable evidence. Sense-Datum Theory and related theories form the main idealist approach to perception, and seem to be based on a misunderstanding of scientific evidence and language use. Its lack of explanation and its sceptical stance also mean that it fails to meet the majority of the criteria laid out in section 2.2. We can therefore confidently limit ourselves to realist approaches to perception.

Gestalt theory fails to offer a comprehensive view of perception and really only focusses on a small number of perceptual effects. Whilst it has had a great deal of influence on perceptual research, in itself it cannot really be considered a full perceptual theory. It also does not offer any insight into the issue of cross-cultural perception, and so has little utility in archaeological study at this time; however, the concepts of figure-ground, gestaltqualitäten and prägnanz could be used when examining the archaeological record. Should such patterns be found in the material culture of past societies, then we can suppose that perception of these qualities is cross-cultural. If this is the case, it lends credence to the idea of unity in perception despite cultural differences.

Probabilistic Functionalism and Psychological Empiricism represent some of the foremost indirect approaches to perception, and whilst they do not address every issue identified in section 2.2 explicitly, the structure of the arguments means that they are all covered. The major problems of hypothesis modification and circularity are not necessarily insurmountable, but they certainly raise questions about indirect approaches. Computational approaches such as Marr’s (1982) suffer from some of the same problems, and arguably start from a false premise of likening the brain to a computer. However, as the discussion of robotics and extended mind showed, multiple realisability can occur across electronic and biological divides. There is then potential for such approaches in the future, but more
advances are required in machine learning and perception before we can make direct comparisons with biological perception. Indirect approaches should not necessarily be discarded then, more evidence is required to make a final judgement on them. Indirect approaches to perception imply the possibility of large cross-cultural variation in perception. Therefore, if an indirect theory was established as the most valid perceptual theory, there would be considerable implications for archaeologists. Whilst there will necessarily be some overlaps in the visual experience of all sighted humans, archaeologists will have very different background knowledge and pre-existing expectations from people in the past; they would therefore perceive many things very differently.

A number of direct approaches to perception have also been discussed which, whilst they vary in approach, are broadly in agreement with each other about the importance of the environment and embodied interaction with it. Ecological Perception covers most of the criteria set out in Section 2.2., and offers some interesting approaches to perception and our interaction with the environment. It does however suffer from a lack of neurological explanation and from mechanisms describing how exactly direct perception functions. The Enactive Approach meanwhile fails to address most of the concerns of a valid perceptual theory, but it does describe in detail how the structure in what we see lends itself to offering information about the world; it is therefore a useful addition to an ecological perceptual theory. These direct approaches are more thoroughly supported by experimental evidence and so are on better standing that indirect ones, but are still not proven. Such direct approaches to visual perception, based on invariable rules of change and structure, would imply little cross-cultural variation, especially in many of the aspects fundamental to visuo-spatial approaches. If they were correct, it would therefore allow greater confidence in archaeological hypotheses. As directly perceived sources of meaning, affordances also offer a potentially powerful tool for the archaeologist looking to understanding meaning in the context of past societies.

The theories discussed in section 2.3.8, taken as a whole, present humans as entities whose cognitive and perceptual capabilities are directly linked to the outside world; they take direct perception one step further, with the world not just serving as its own best model, but being integral to acts of perception. The Extended Mind Hypothesis is the most neurologically valid
of all the theories discussed, being built on actual experimental evidence, and these extended approaches circumvent some of the standard problems facing perceptual theories through their approach. Hurley’s motor control theory and the implications of extended mind for perception, whilst compelling, do not amount to a comprehensive account of perception. They are also lacking a sound body of supporting evidence and as such these approaches cannot stand as an adequate perceptual theory. Whilst the neurological evidence is not enough to provide an answer to the question at the heart of this study, the Extended Mind Hypothesis and the Enactive Approach offer interesting approaches to tackling it. For Malafouris (2008b), for example, it is likely that people in the past held different conceptualisations of the self than people today, which could lead to different perception. However, Malafouris’ account is focussed on engagement with material culture; if we were to expand the extended mind approach beyond this to landscape, would we be drawn to the same conclusion?

These theories also raise interesting ideas for other areas of archaeological research. If we accept that an extended mind constitutes an extended self, for example, as it certainly seems in the case of the Alzheimer’s sufferer, then it may be that modification of a person’s environment would have an effect on them as a person. This concept brings new possibilities for research in to the modification of landscapes throughout the past, be it through monumentalisation, land division or urbanisation. The effect modifications may have on people, and whether they could in turn bring about other changes to culture and landscape, is of clear interest. Clark and Chalmers (1998: 18) also asked whether certain forms of social activity might be better conceived as thought rather than communication and action. This too could be used as a means of reconceiving the acts of past people. Might movement through ceremonial landscapes, for example, be a way of thinking through a person’s relation to the world, their ancestors and other people, or perhaps a way of defining the self?

Change to the environment has often been raised as a key factor in understanding the past. Any attempt at perceiving the environment in the same way as past peoples is doomed to fail if it has changed too much. If we accept the significant role the external world plays in our perception then this problem is only exacerbated. Landscapes which have been dramatically altered since the period of study will have limited information to offer us. Landscapes which
have seen less change, and for which we can build up detailed environmental evidence about erosion, vegetation cover and of course human action, will allow us a considerably more accurate look at past people’s relation to the landscape.

It is important to note that whilst Ecological Perception has been criticised for having low neurological validity, in actual fact many of these theories fail to explicitly engage with physiology and neural processing. This is likely because not only is such research difficult and costly, understanding how particular parts of the brain function and carry out perceptual processes doesn’t help to build a full picture of how perception works. Whilst the physiology and neural processing cannot be ignored (Bruner et al.’s (1951) purple suited cards show that some form of processing using a pre-existing knowledge base must occur), there is a big gap between understanding this, and understanding how we see.

This chapter has demonstrated that perceptual theory has some potentially very useful insights to offer archaeological research, but apart from Phenomenology, Ecological Perception and to a lesser degree the Extended Mind Hypothesis, this work has been largely ignored. No single approach discussed here holds all the answers, however, a combination of compatible theories may offer a consistent theory of perception which can address the issues at hand. This literature review has not been conclusive in determining which theory offers the most valid explanation of visual perception, therefore more evidence needs to be considered.

Much of the work discussed so far has taken place in an exclusively western context (Henrich et al., 2010); inter-group variation may therefore be far more extensive than this work might suggest. As such, Chapter 3 will look at perceptual experiments in more detail, to ascertain what more may be learnt about perception in general, and cross-cultural perception specifically. This will be brought together with the findings of this chapter to determine the most valid theory of visual perception and establish the extent of cultural variation.
3 Cross-cultural Perception and Perceptual Experiments

The theories discussed in Chapter 2 each have their own implications for perceptual variance across cultures, but they have primarily been researched in a western context (Henrich et al., 2010: 63). Whilst inter-personal variation in perception may be limited to the effects of attention and intent, it is possible that there are cultural or environmental factors which will cause variation in perception between groups. This is important, as archaeological study is almost always focussed on cultures different to our own. Arguably one of the most significant differences between modern and past people is the culture in which they are enmeshed. It is therefore vitally important to determine what effect culture has on perception if one is to determine the extent to which modern and past people perceive the landscape in the same way. As such, this chapter will review the experimental literature on cross-cultural perception in an attempt to determine the scale and nature of any differences. To put this research into context the chapter starts with the implications of perceptual theory for cross-cultural perceptual variance.

3.1 Theoretical Implications

Each perceptual theory discussed in Chapter 2 has different implications for cross-cultural perceptual variance, depending on how it interprets the act of perception. Probabilistic Functionalism and Psychological Empiricism, with their emphasis on acquired knowledge and the mediation of input to form hypotheses, would suggest that visual perception varies across cultures. Each culture will impart different knowledge and experiences to its members and so the basis on which visual stimuli are interpreted would be different for each culture, resulting in potential divergence, at least with initial hypotheses.

Sense-Datum Theory also suggests perception is very subjective. As sense-data are related to the world in an unknown way, there is no way of matching each individual’s experience. For Robinson (2001), the properties of the world are created by the observer and it is therefore highly likely that culture would have a considerable effect on perception.

Approaches such as these suggest that our perception of the world involves the creation of internal representations, however, one might question the need for them. Why should the
brain need to recreate parts of the environment when it is there to be accessed? Internal models would have to deal with real time situations in a constantly changing environment, and would therefore constantly have to be checked and updated against the real world. Given the need to constantly use the real world, it seems redundant to create an internal representation. Whilst there must clearly be some form of representation in the memory, this cannot be classed as a key element of perception.

Nöe’s (2004) Enactive Approach to perception implies that visual perception is, in a sense, innate and cross-cultural, as it relies on movement and sensorimotor knowledge. Since all humans naturally share the same types of bodies and movement, and we all experience the world with the same rules, we should all develop similar sensorimotor knowledge and therefore perceive the world in a similar way. Nöe (2004: 188) does qualify this however, arguing that just because one has a visual experience, one need not be inclined to judge things the way the experience presents them as being. Perpetual experience is “belief-independent” in this way (ibid.). A prime example of this is that even having drawn an illusion oneself, the effect persists. Perception is not “belief indifferent” however, since perceptual experiences are relevant to how one judges the world to be (ibid.).

As already discussed, Active Externalism and the Extended Mind Hypothesis allow for a conception of perception in which the world takes part of the burden, in an extended coupled system. In such a model of perception, individuals are more likely to perceive the same environments in a similar way, as part of the work is done for them by that environment. If this is the case, then the perception of the environment may not vary across different cultures.

Gibson’s theory of Ecological Perception suggests that perception is direct and with invariant rules specifying the content of perception, there is little room for individual divergence. Affordances, whilst animal specific, are also in a sense objective, as they represent features of the environment (Gibson, 1986: 129). In addition, they are intrinsically based around the body of the perceiver and thus the affordances a natural environment offers should be the same, regardless of cultural background. However, affordances of some anthropogenic aspects of the environment (or culturally significant parts of the natural environment) may not be cross-cultural, and this has potentially significant implications for perception if we
accept affordances as a fundamental element of perception, as a number of direct theories do. A more detailed discussion of affordances, in the context of cross-cultural perception is thus warranted.

3.1.1 Affordances

Whilst the concept of affordances as described by Gibson may seem relatively straightforward, it has in fact caused considerable disagreement between proponents of Ecological Perception. Sanders (1997: 99) asserts that the existence of affordances is uncontroversial, since one cannot deny that there are opportunities and dangers for an organism present in the environment. Exactly what an affordance is, how it relates to the environment and the perceiver, and what implications all of this may have for perception has been the topic of much debate however (Michaels, 2003; Stoffregen, 2003). As with other aspects of the perceptual literature review, the use of affordances within archaeological research will not be discussed. What is of interest here is what affordances may tell us about how perception works. This information may then be applied to archaeology, but how archaeologists have already used the concept is not directly relevant to increasing this understanding and answering the research question of this thesis.

Perhaps it is best to begin by stating what an affordance is not. Although the word has often been used as such by cognitive scientists, an affordance is not a mental state regarding potential for action (Michaels, 2003:136); they are mind independent.

Sanders (1997:104-105) argues that Gibson saw affordances as the link between the perceiver and the environment, but one could easily state that Gibson saw them as properties of the environment which became relevant as affordances, depending upon the perceiver. This split marks one of the major divides in Ecological Psychology; are affordances relations between an animal and its environment, or animal relevant properties of an environment (Chemero, 2003: 184; Stoffregen, 2003: 117)?

How affordances are conceived affects how they might act in a cross-cultural context. Certain conceptualisations of them suggest that they are based in the individual, and others that understanding another’s action is a cognitive act. Both of these distance Ecological Perception from limited cultural variation through direct perception.
The first attempt at a formal definition of affordance was by Turvey (1992), who held the view that affordances were strictly properties of the environment. These properties are one half of a disposition that allows an animal to perform a certain act (Stoffregen, 2003:118). Corresponding properties in the animal, called effectivities, form the other half and allow it to carry out that act in that environment (Michaels, 2003:139). For each affordance an environment offers, an animal has an effectivity to exploit it, and vice versa. This of course precludes all attributes of an environment being affordances and all attributes of an animal being effectivities, since they require this pairing. Limiting the concept of affordances in this way was no doubt one of Turvey’s motivations. Witt and Riley (2014) also see affordances as properties of the environment; however, they note the changing nature of one’s relationship to the environment based on skill and internal states, such as hunger, tiredness etc. They demonstrate that such things alter one’s perception of the environment through the extended global array, tiredness causing hills to seem steeper or carrying heavy things making distances to seem longer (Witt and Riley, 2001: 1358).

Stoffregen (2003) has criticised this view for being incompatible with many of the accepted characteristics of affordances, for the fact that dispositions must always be actualised, and for such affordances having an uncertain relationship to direct perception. Stoffregen (2004: 82) asserts the importance of distinguishing “what I can do” from “what I want to do” for affordances to have any practical meaning in the ecological approach. The former is an affordance; the latter is a goal, intention or need (Stoffregen, 2004: 82; Rietveld and Kiverstein, 2014: 341).

Affordances are now more commonly seen as relations, either between properties of the animal and situations (Chemero, 2003), or between properties of the animal and properties of the environment (Stoffregen, 2004). In these views, the context in which an animal finds itself has certain properties, some of which have an impact upon the animal, depending on its own properties. The direct relationship between these properties is the affordance. For example, the relationship between stair height and one’s leg length is the affordance, which allows, or does not allow, one to climb stairs. It is neither the property of the environment itself nor the property of the animal that define what is possible, but the two together. This approach then essentially combines Turvey’s (1992) affordance and effectivity into one.
Stoffregen (2003: 123) presented this view as emergent properties; affordances are properties that are not inherent to the constituent elements (animals and environments) but develop from them. To demonstrate how emergent properties can exist and have properties themselves he talks about triangles; each line in a triangle is its own entity, with its own properties, but when joined together they create the property of triangularity, and this triangle has its own properties which are distinct from those of the individual lines (ibid.).

Michaels (2003) and Kirlik (2004) take this relational approach one step further and state that affordances are only an animal’s opportunities for action in these relations. Although on the surface a small change, this has major implications on what an affordance can be. Limiting affordances to actions changes them from Gibson’s (1986:127) assertion that they are what the environment offers the animal for good or ill; danger or the potential to offer nutrition are no longer affordances (Michaels, 2003: 138). Equally, the perception of affordances available to others no longer constitutes the perception of an affordance (ibid.). They argue that this is necessary to avoid affordance becoming a synonym for meaning (ibid.). If one adopts this view of affordances then understanding the actions of others, especially those who are not present, and who come from a different context, ceases to be a matter of direct perception, but becomes cognitive.

Gibson (1986) believed affordances to be directly perceived, but stated that identifying the information which specifies them was one of the key challenges for ecological theories. Stoffregen (2003: 129) offers a solution through his treatment of affordances as emergent properties. He notes that movement is an emergent property, since it can only ever be defined relative to an environmental property, and it is considered to be perceived directly in Ecological Perception (ibid.). He therefore proposes that affordances may be perceived in much the same way (ibid.). This thesis would argue that this is a poor example, since there are clear changes in stimulation which specify movement. Perhaps a better one is triangularity, an emergent property that is not specified by any particular stimuli, but by a certain structure to the optic array which exists prior to any cultural labelling. This direct perception of triangularity is an example of gestaltqualitaten, a well proven perceptual effect. Perhaps then, in the same way that we can directly perceive shape, we can directly perceive...
affordances, with no requirement for further mental work. This may be the case for what this thesis will class as lower order affordances, but not higher order affordances.

The distinction between higher and lower order affordances can help us to distinguish the split between perception and cognition, and thus what might reasonably be considered cross-cultural, if Ecological Perception is correct. Objects which have affordances dependent upon prior knowledge could be culturally constituted, for example a post box affords posting a letter and a football pitch affords playing football. However, these culturally constituted affordances tend to be complex and abstract; the form of the items is not a clear indication of their use. This issue is very closely related to archaeology; a great deal of archaeological practice is discerning what past people did with material culture, in other words, what these items of material culture afforded. There is no guarantee that we will ever be able to know precisely what some things were used for. Things such as chairs, caves and trees however, although laden with a great deal of extra meaning, also have very simple non-cultural specific affordances, such as sitting, shelter and climbing. The post box also has simple affordances, such as putting things in the hole in order to be stored; knowledge of the postal system is only required for the higher level affordances. These lower order affordances are based solely on the relationship between the body and the environment. It thus might be argued, that the basic affordances and perception of the environment might be cross-cultural and it is only more complex, socially defined aspects, which might depend on prior cultural knowledge.

This is not a binary split however; there is a continuum of increasingly specific affordances requiring increasingly more cultural knowledge, and the specific affordances are built up from a number of more basic ones. The post box affords posting a letter but only because it affords storing of items and putting items into that storage space through a slot. Heft (2007:98) describes places as behaviour settings, they afford particular actions at particular times, depending on one’s understanding of the associated cultural norms and their place within them; but these affordances are also on a continuum. A stadium or a theatre affords sitting, beyond that it affords doing so for large numbers of people, all of whom have their attention directed to one area due to the seating arrangement. It also affords (mostly) unobstructed views of the stage, court or pitch. These combine to afford a group watching the same space. With a little more cultural knowledge we might discern that this is for the purpose of a
performance. With yet more, we may be able to distinguish between the performances in those spaces; a play or music in a theatre and sport in a stadium. With yet higher levels of cultural knowledge we can determine, for example, what type of sport is played in a particular stadium, due to the shape of the open space, the markings and any fittings. In other words, we perceive qualities before meaning. Stoffregen (2004:82) has noted that affordances are often nested, rarely emerging from a single property of an animal-environment system. This thesis would argue that this is certainly the case with higher order affordances, they are nested within, or perhaps more accurately built upon, lower order affordances which emerge directly out of body centred animal-environment relations. Indeed for something to adequately function as intended we might posit that it is necessarily built upon the relevant lower order affordances, such as those we see in a stadium or theatre.

The distinction between higher and lower order affordances allows the concept to move beyond merely relating to one’s own action as Michaels (2003) and Kirlik (2004) suggest. Michaels (2003: 138) asserts that danger, perception, nutrition etc. are not affordances, however they are evidentially emergent properties of the animal-environment system which have associated possible actions. Falling off a cliff is not an action and neither is the danger associated with it (ibid.), but this danger and the actual fall only emerge out of the properties of the animal and the environment. This thesis would argue therefore that danger, nutrition etc. are affordances, in that a cliff affords danger because of its nature and how that relates to certain animals, an apple is nutritious because of its properties and how they relate to the digestive system and nutritional requirements of certain animals. One could thus argue that these concepts fall under the category of higher order affordances, they rest upon a number of properties and affordances in the animal-environment system; if you can fly, if the air affords flight, or if you don’t fall or if the cliff is not high then there is no danger. The perception of these properties is therefore not direct, but an act of cognition built upon a number of directly perceived properties and affordances.

There is still the issue of understanding another’s action, however (Michaels, 2003; Kirlik, 2004). There seems to be no reason to move the understanding of lower order affordances available to another into the category of higher order affordances; if one can perceive that an action is, or would be available to oneself, then surely one can perceive the same opportunity
for action in another with the approximately the same body schema. We might even go further, and assert that a fundamental understanding of the abilities of certain body schemas and scales and how they relate to the environment, through analogy with one’s own perceptual and motor experience allow this for those who are different from ourselves. Again there seems no reason to describe this as a higher order ability, something which is consciously cognitive, since it is based in a fundamental understanding of the world. Despite the expansion beyond what Michaels (2003) and Kirlik (2004) are comfortable with, the term affordance has still not become synonymous with meaning under this conceptualisation.

This discussion has suggested that affordances are emergent properties of the environment and animal, and that some affordances, which are based in biology and physical laws, are lower order and so directly perceived; they are therefore cross-cultural. As affordances become increasingly higher order this direct perception ceases, however, the combination of certain properties can suggest a great deal.

3.1.2 Summary of Theoretical Implications

Each of the theories discussed has its own implications for the issue of cross-cultural perception. Whilst some suggest that visual perception is innate or develops along the same lines, others suggest that foreknowledge and experience are the governing factors. Even within broad theoretical trends there are variations in detail which can have major implications for the understanding of perceptual variance across cultures, as demonstrated by the discussion of affordances. Each approach leaves us with a different conception of how comparable individuals’ visual perception might be, and to what extent vision is cross-cultural. In order to gain further insight into this issue, and to aid in the comparison of the different theories of perception, a review of the experimental literature dealing with visual perception is required. The majority of work on cross-cultural perception has focussed on the perception of pictorial representations and illusions, and so this is where the discussion will begin.

3.2 Illusion and Pictorial Representations

Deregowski (1980: 13) posits that the environments in which people live, shape their perception. In particular, he highlights the importance of natural vs. artificial environments,
stating that the dominant presence of right angles in artificial environments would lead to individuals interpreting ambiguous angles as right angles (ibid.); a prime example being the Müller-Lyer illusion. In cultures where right angles are rare (such as some prehistoric societies), Deregowski argues that one would expect no misperception; thus one would expect to observe differences between city dwellers and traditional Zulu, who live in hemispherical huts and have almost no rectangular objects (ibid.). Indeed a number of the perceptual theories discussed above assert the importance of the environment in perception/perceptual development. However, while some studies seem to support this carpentered world hypothesis, others, such as Gregor and McPhearson’s (1965), found no difference in susceptibility between aborigine groups living within and outside of such environments. Others have hypothesised that retinal pigmentation may cause different responses to illusions, but experiments have come to contradicting conclusions (Davidoff, 1975: 97-98). In addition Ahluwalia (1978) found that a modified Müller-Lyer illusion (Fig. 3.1) had a greater effect on urban participants than rural ones, even though it can’t be seen as a representation of three-dimensional space, and both groups were more susceptible to it than the standard illusion.

Figure 3.1- A modified Müller-Lyer illusion. The line on the left is perceived to be shorter than the one on the right, when they are in fact of equal length. This effect is caused by the circles on each line.

One experiment which used a real world illusion as its basis was conducted by Allport and Pettigrew (1957), using a rotating trapezoidal window. In this illusion the viewer sees the window as rectangular, and as orientated at an angle other than that which it is. Every half turn the window appears to reverse direction, maintaining this illusion. They found that rural
and urban Zulus, and urban South Africans of European origin, were all equally susceptible to the illusion (ibid.). Only under sub-optimal conditions did disparity emerge between the groups (ibid.). This Ames Window, like the Ames room, is based on a static viewpoint and suggests that the carpentered world hypothesis is false, since people from all backgrounds are susceptible to it, yet Stewart (1974) linked susceptibility to the Ames Room to environment.

Work by Seckel and Klarke, and Gregory demonstrated that the Ames Room works by manipulating the fact that distance is indicated by the base of an object rising to meet the horizon, and the top dropping towards it (Illusion Works, 1997). By having a horizon which is not horizontal the Ames Room disrupts our natural distance cues, the room itself is incidental, the illusion working even on a blank background (ibid.). These findings conflict with the conclusions of Stewart (1974); however, her work was conducted with a miniature model which may not be accurately representing the illusion’s effects. Given that distance is a fundamental aspect of spatial perception, and key to a lot of archaeological landscape research, ascertaining the extent to which the mechanics of distance perception are the same across cultures is very important. Testing Ecological Perception’s distance cues would also be of interest.

Studies of the Ponzo illusion have found differences in susceptibility between cultures, but also show differences within cultural groups based on education, suggesting that culture is not the root cause (Deregowski, 1980: 47). Segall et al. (1966) set out to test whether culture affects perception using a number of different illusions and a broad range of cultural groups. They found a great deal of variation in scores, with different groups being more susceptible to different illusions (ibid.). Whilst they assert that environment is the cause for the differences, there are a number of instances where groups do not perform as they should, given their environment. A great deal of the evidence for cross-cultural differences in susceptibility to illusions is contradictory, and there are thus no clear reasons as to what might cause any difference. In addition, Davidoff (1975: 99) reminds us that whilst many reports do suggest at least some specific cross-cultural differences, it is very hard to prove that there is no difference between any two groups of observers, and such results are less likely to be disseminated. The study of perceptual variation between cultures through the use of illusions
has therefore failed to conclusively determine not only what might be the cause of perceptual variation between groups, but also whether there is in fact any variation. We must therefore look to another major aspect of cross-cultural perceptual research, the perception of pictures.

Following William Hudson’s work in the 1960s, in which he showed groups of varying ages and backgrounds a series of images designed to test their ability to perceive depth (Fig. 3.2), a great deal of the research on cross-cultural perception has focussed on this. Since the perception of depth in these pictures involves relative size and occlusion, both of which are present in our perception of the environment, this may be closely linked with spatial perception in the environment. The perception of pictures is also an area of veridical perception unlike illusions, and so may be a better representation of everyday perception. Hudson’s (1960) groups included White school children and labourers, and Black Bantu school children and adults with a range of backgrounds. Hudson (1960) concluded that experience with pictures and schooling were important factors in perceiving depth in pictures, and that in general the Black Bantu participants were less able to perceive depth in pictures. He went on to carry out further tests to support his conclusions (see Hudson, 1962a; 1962b; 1967), the trend being for a racial or cultural divide in pictorial depth perception (ibid.).

As Hudson was the first person to systematically test in this field, his studies became the template for many other pieces of research (Deregowski, 1972). The impact of Hudson’s work on cross-cultural studies of perception is considerable and it continues to be used to this day.

Figure 3.2- Images used by Hudson to represent depth cues in horizontal space (Hudson, 1960).

P1 uses relative size, P2 and P3 add occlusion and P4-6 use size and perspective. Hudson also used similar pictures to represent depth cues in vertical space (see Hudson, 1960 p. 187).
However, as I have argued elsewhere, this major aspect of cross-cultural research has been unduly influenced by Hudson’s work (Campbell-Bell, in preparation). Hudson’s work has methodological issues (see Jahoda and McGurk, 1974; Omari and MacGinitie, 1974; Hagen and Johnson, 1977; Jones and Hagen 1980; Schumacher, 2009), including the experimental procedure, materials used, major problems with the group demographics and conclusions which do not meet the data presented (Campbell-Bell, in preparation). These problems, combined with those present in his other studies in cross-cultural perception, bring the validity of his work, and that based on it, into serious question (ibid.).

One thing which might be taken from Hudson’s (1960) test is the relative importance of depth cues. All of Hudson’s groups performed better on pictures that used occlusion as a means of specifying the layout of the scene. This attests to the importance of occlusion in the perception of the environment, something which Gibson stressed.

Deregowski (1972) carried out an experiment in which subjects were asked to build models of the drawings in Figure 3.3. Some subjects previously classed as three-dimensional perceivers on Hudson’s test built flat models, whilst a substantial minority of two-dimensional perceivers built three-dimensional models (Deregowski, 1972: 85). Children grouped by the model test were then asked to copy the Devil’s Pitchfork (Fig. 2.5) and a normal trident, with the originals hidden under a flap which had to be lowered for ten seconds before drawing (ibid.). Three-dimensional perceivers spent much longer looking at the Devil’s Pitchfork than the trident, whilst two-dimensional perceivers’ times did not differ significantly (ibid.). The so-called two-dimensional perceivers contained the majority of tribal Africans tested. (ibid.). For Deregowski (1972), these experiments indicate that they perceive pictures, and depth cues in particular, differently from groups which live in urban environments. Given the ambiguous results however, there may well be other factors involved such as education, intelligence, experience with pictures, or the nature of the instructions given, as both two-dimensional and three-dimensional models are accurate representations.

Jahoda and McGurk (1974) carried out studies similar to Hudson’s (1960), which addressed the methodological issues they raised. Whilst Mundy-Castle (1966), using Hudson’s test, had found only one child in his Ghanaian sample who gave consistent three-dimensional responses, Jahoda and McGurk found the difference between Ghanaian and Scottish children
to be relatively small (*ibid.*). Further studies by Jones (1974) and Leach (1975) show that it is in fact exposure to pictorial material which affects one’s ability to read depth in pictures, not race or culture. As these studies were more methodologically sound and not victim to the biases of Hudson’s work, it is reasonable to accept their conclusions that culture does not in itself have an effect on pictorial depth perception (Campbell-Bell, in preparation). Therefore, providing that there is a link between pictorial and environmental perception, this suggests that spatial perception is not culturally specific.

![Figure 3.11: The drawings which Deregowski asked subjects to make with clay and sticks (Reproduced from Deregowski, 1972).](image)

The experiments discussed so far do not provide clear answers as to whether perception is affected by culture. Some studies suggest that it is not, whilst others suggest that there are factors, be they biological or environmental, which affect our perception; both of these tend to be linked to culture, as cultural groups are often regionally restricted. Whilst it can be argued that perceiving depth in pictures uses some of the same information as in spatial perception, illusions are clearly ecologically unrepresentative (Segall et al., 1966: 77). One might argue that even accepting a clear difference in the perception of illusions does not necessarily imply a difference in real world perception. Perhaps, when the perceptual system fails, individual experience has a greater effect on how we respond. Whatever the case, pictures and illusions are not wholly representative of environmental perception; therefore, any conclusions drawn from this research must be considered preliminary. The next section therefore discusses real world perceptual experiments which may offer further insight into the nature of visual perception.
3.3 Real World Perceptual Experiments

A significant number of experiments have been conducted in order to better understand the development of visual perception. Walk (1981: 1) argued that the earlier a perceptual process can be inferred, the more likely it is to be innate or unlearned. Any innate perceptual processes will be cross-cultural, since they are based on biology. The more aspects of visual perception that can be classified as innate the greater the case for a valid epistemological grounding to visuo-spatial approaches to landscape archaeology. Experiments with infants have shown that a number of processes are functional within the first few months after birth (Walk, 1981). Infants have stereoscopic vision, fixate on things and are sensitive to movement, suggesting these are innate processes, or at least that they mature very early (ibid.); at such an early age it is difficult to argue for a strong cultural or environmental influence. Experiments have shown that infants of four months, before acculturation has taken place and language skills develop, discriminate between hues in the same way as adults (Bornstein, 1990: 290; Franklin and Davies, 2004), and a study by Bornstein et al. (1976) suggested that colour identification is much the same across cultures in adults. However, more recent studies suggest that colour terms may have an influence; whilst the Dani of New Guinea, who only have two colour terms, can distinguish colours as well as someone familiar with the main 11 English colour divisions, people whose language has more than these 11 divisions have an increased ability to discriminate between colours (Wolfe et al., 2015).Bornstein (2006; 2007) concurs that this difference in perception is brought about by language; whilst colour perception is universal in infants, in cultures which have different colour terms adults perceive colours differently, for example combining green and blue. Bornstein (2007: 13-20) and Franklin and Davies (2006) explain this through different experience in early life (as with phoneme perception) and retinal pigmentation. Infants also perceive the constancy of shape and size, and within five minutes of birth will follow head shapes with normal features more intently than those with scrambled ones (Gordon, 1989: 70).

There is also evidence that blind people who have had their sight restored can perceive lines, edges, brightness and colours without difficulty, and organisation into figure and ground takes place quickly (ibid.). This is evidently not the result of experience or learning, and thus
must be an innate characteristic of perception (*ibid.*), indeed these appear to be based in physiology (Bornstein, 1990: 291; Gregory, 1998: 76; Harris, 2014; Wolfe et al., 2015). Interestingly such individuals are also susceptible to the Ponzo and Müller-Lyer illusions, demonstrating that they do not rely on learned experience, but inherent characteristics of perception (Gandhi et al., 2015). As Gordon (1989: 71) states:

“if perception is shaped by innate brain processes, and if all human brains are essentially alike... then perceptual processes should be similar in all peoples”

Whilst there are neurological changes associated with activity (Malafouris, 2010a: 268), which may be culturally determined (Bornstein, 2006; 2007), the fundamental workings of the brain should be consistent across all humans. Indeed, much neurological experimentation has been based on the very premise that this extends across species boundaries.

Walk and Eleanor Gibson conducted a series of experiments looking at the perception of depth using a visual cliff. This has a central board flanked by glass surfaces, below which are checked patterns; one directly below the glass, and on the other side, one some distance below it (Gibson and Walk, 1960; Walk and Gibson, 1961). This gives the visual impression of a cliff, when there is none (*ibid.*). Infants would cross the shallow side, but not the deep one (*ibid.*), showing that these infants perceive depth, a key aspect of spatial perception. Walk (1981: 42) notes however, that since the infants are old enough to crawl, they will have had an extensive period of visual experience, meaning that depth perception cannot be considered innate from these studies. Schwartz, Campos and Baisel (1973) placed infants of different ages on each side and measured their heart rate. At five months the infants’ heart rate decelerated on the deep side, whilst at seven months it accelerated, suggesting fear (*ibid.*) and thus that depth perception is an early development. Given this, the possibility remains that depth perception is developed similarly across all cultures, but in order to confirm this, a visual cliff study with infants from around the world would be required. Experiments have shown however, that amongst a range of animals, depth perception is present from the day of birth, or as soon as they are mobile, even if reared in the dark (Walk, 1981:92-94). This suggests the possibility that at least certain aspects of spatial perception, such as depth, may be almost universal. Given the importance placed upon the spatial
structure of landscapes and movement through them, this is an important consideration for landscape archaeology.

The importance of sensorimotor knowledge was demonstrated by Riesen and Aarons (1959); they reared three groups of kittens, one exposed only to diffuse light, depriving them of form perception, another kept in holders so that they could not move but could see the environment, and a control group that could freely explore their environment (ibid.). Both the form and locomotion deprived kittens were deficient in discriminating between a stationary and a moving cross; leading them to conclude that meaningful contact with the environment is required for normal perceptual development (ibid.). Held and Hein (1963) undertook a similar experiment, in which kittens reared in the dark were either allowed to actively explore their environments, or were placed in holders pulled around by their active counterparts for brief periods each day. The latter performed at chance level on the visual cliff, whilst the active kittens detected depth perfectly (ibid.). Held and Hein thus concluded that active locomotion in a lit environment is necessary for the development of proper spatial perception (ibid.).

Walk, Shepard and Miller (1978) carried out a similar experiment, which Walk (1981) believes disproves Held and Hein’s assertion. In this experiment, one group of kittens was held passively in holders, whilst another group, also in holders, had their attention drawn by moving toy cars (Walk, 1981: 99). The latter group performed considerably better and were no different from fully active kittens on the visual cliff (ibid.). For Walk (1981) this shows that active locomotion is not required for the development of depth perception. This is not necessarily the case, however. Figure 3.4 shows the holders in which the kittens were placed, and it is evident that they were able to move their heads; what Gibson (1986) called ambient vision. If both groups had control over their visual input in a way which kittens being passively moved did not, the question remains of why one group did not develop proper spatial perception. Neither the abstract from their paper at the conference for the Society of Neuroscience (Walk et al., 1978) or Walk’s (1981) discussion, indicate anything about the environment in which the fully passive group of kittens was kept. However, given the aim of the experiment, we can assume that the passive group could see only a blank wall. In this situation, even with the ability to control input through movement of the head, the
development of sensorimotor knowledge would not occur, as any movement would result in the same stimulation. The other group had a toy set to look at, and thus their movement would cause input changes, allowing the development of the sensorimotor knowledge required to perform appropriately on the visual cliff.

Again further testing could resolve this issue; if one were to repeat Held and Hein’s (1963) experiment, but with the locomotion taking place in an open environment, giving both something to attend to, the importance of self-controlled movement could be ascertained. Walk’s (1981) discussion shows that the exact nature of stimulation does not affect the development of spatial perception, so long as the input is structured and either attended to, or controlled by movement (depending on which is found to be the most important factor), perceptual development occurs in the same way. This is arguably analogous to people growing up in different environments and cultures; the exact content will vary, but the rules specifying their interaction with the environment, and the development of sensorimotor knowledge, will be the same.

A number of experiments suggest that the perceptual process does not use internal models of the world, supporting direct theories of perception. Ballard et al. (1995), Land et al. (1999) and Hayhoe (2000), have all shown that before we pick up objects, we fixate on them. If we used internal models of the world this should not be necessary, as we would have the location of the object stored in our model. Other experiments, on individuals with brain damage, have shown that they can grasp objects accurately, despite having no explicit awareness of their size or shape (Milner and Goodale, 2002: 524). Milner and Goodale (2002: 525) suggest that
we carry out these functions using visual information that we are not consciously aware of, and which is independent of an acquired knowledge base. They also note that the perceptual control of action is unaffected by illusions, allowing people to reach for objects appropriately even when an illusionary effect makes them appear in a different location or as a different size (ibid.) (for example the Titchener illusion; Fig. 2.7). All of this does not preclude the use of internal models for other activities such as navigation; however, this is not purely perceptual, but an act that involves perception, memory and deductive reasoning.

Finally, Eleanor Gibson and Walk demonstrated that the perceptual system is self-teaching; people can learn from experience, without any form of external feedback (Reed, 1988: 189). Students were asked to distinguish different wines, and after 10 trials went from being correct only 1/3 of the time, to 2/3 of the time (ibid.). In addition, there was no difference between students who had their errors corrected and those who did not (ibid.). This experiment offers a very real case for perception developing in most individuals in the same way, regardless of culture, since external feedback does not seem to affect its development. Reinforcement of certain things or the teaching of certain information does not bias the perceptual system’s ability or response. It is one’s use of the perceptual system which allows it to develop, and this will be much the same for all able individuals.

From the experiments discussed, it is clear that some aspects of perception are present at birth, and that our perceptual abilities undergo self-driven development. In visual perception, this development seems dependent upon self-actuated movement; this brings about the development of spatial perception at around seven months. Due to the innate nature of some aspects of perception, theories based on the formation of hypotheses or other mental mediation seem to be incorrect; there is no time for the infant to learn anything which can be put to use in forming the mediating processes.

Snapshot and retinal image views of perception also seem to be incorrect; experiments have shown that perception is constant and reliant on dynamic interaction rather than static unconnected views. Instead it seems that unchanging rules of structure in the light reaching the eye are the basis of visual perception. These experiments thus support the idea that parts of perception are innate, and that the further development of the perceptual system will be similar regardless of cultural context. A detailed analysis of spatial perception is lacking in the
experimental literature, however, and whilst an improvement over experiments which look at illusions or drawings, many of these studies have still been in strictly controlled laboratory conditions (sometimes necessarily so) which do not reflect the complexity of real world perception. As with much of the perceptual literature, the studies which have used human subjects have tended to be western centric, and whilst animal studies offer useful insights their applicability to human perception cannot be guaranteed. We are then still some way from determining the extent to which one can suppose a common perception of the landscape between past and modern people. The experiments discussed in this chapter can however be used to inform which perceptual theory best meets the requirements of explaining visual perception and best matches the evidence.

3.4 Ecological Motor Theory

Chapter 2 demonstrated that direct theories of perception have greater explanatory value. Perceptual experiments discussed in this chapter suggest that perception is direct and its development is driven by perceptual experience rather than hypothesis testing. It has already been noted that taken together, Nöe’s Enactive Approach and Gibson’s Ecological Perception address many of the issues facing perceptual theories, and both are in accordance with the experiments discussed throughout this chapter. Their emphasis on perceptual development through movement is also strongly supported by the experimental evidence. Some of the ideas discussed for extended cognition and perception, especially the work of Hurley (2001), can help further elucidate this process. The Extended Mind Hypothesis incorporates neurological evidence which demonstrates that activity can change the structure of the brain (Malafouris, 2010a), adding a potential neurological component to the concept of perceptual development through action. There is, for example, neurophysiological evidence which suggests shared coding for perception and action (Hurley, 2001: 12), reinforcing the links between the two, which Nöe (2004) also suggests.

These extended theories present the individual and the environment as part of a coupled system, in which the environment is vital for perceptual feedback and plays an active role in cognition. If we remove part of the environment involved in our cognition, our cognitive capacity is diminished. Likewise, if we are removed from the environment we cannot perceive. This seems a strange thing to assert but it is too often taken for granted in
perceptual theories, resulting in a view of perception which is very much separated from the
world. Instead, internal models or extensive mental processing take the burden of perception.
Direct theories of perception in which the world stands as its own best model seem to be the
most appropriate, and if we accept the arguments of Clark and Chalmers (1998), Malafouris
(2004; 2008a; 2010b) and Hurley (2001), it seems logical to take the extra step and afford the
world an active role, not just in cognition, but in perception too. The blind person’s stick has
already been accepted as an integrated part of the perceptual system, why not the rest of the
environment? Just as the environment can reduce memory load in cognition, the feedback it
offers could do the same in perception, and just as the blind person’s stick becomes an
extension of their senses, so too can the rest of the environment. Our short term memory can
only hold so much information, and our brains can only process so much at once. As this
information exists out there in the environment, why not let it stay there, ready for when we
need it? The environment it is not simply something to be observed in a detached manner;
our acts affect it, as it in turn affects us, in a dynamic feedback loop of the sort Hurley
proposes. The more successful electronic approaches to perception certainly suggest the
importance of an interplay between environment and individual, in a process which Clark
(1998: 165) likens to a conversation or musicians playing together. Indeed, this sort of view is
not uncommon in landscape archaeology, it is often asserted that places are dynamic
participants in past behaviour rather than passive backdrops (Branton, 2009:51).

If the environment plays this active role in perception, then for individuals in the same
environment, part of the perceptual process is the same. With part of the perceptual burden
on the environment, individuals do not just perceive from the same starting point of an active
human body, as Nöe (2004) suggests; part of the work is already done for them, both in terms
of invariants in the environment and the fixed way in which the environment will offer them
feedback. It is important not to over emphasise its active nature though, giving it agency;
again intent is the distinguishing factor. It will only specify certain things, and the way it offers
feedback, is necessarily regular and consistent. To be otherwise, would preclude the
development of perception, and the relatability of an individual’s perceptual experience.

Given Gibson’s (1986) assertions of a structured ambient optic array which responds in an
ordered way to movement, and of affordances which are both based in the environment and
the body of the perceiver, it seems logical to incorporate this coupled system into Ecological Perception. A synthesis of these compatible theories into a single ‘Ecological Motor Theory’ will result in a considerably stronger and more informative theory of visual perception, which addresses some of the weaknesses of the concepts in isolation. In such a synthesis perception is direct and non-inferential; the world serves as its own best model without any mediation. The perceptual process is one of skilful activity in which the body, brain and environment are part of a coupled system. Fundamentally perception is not detached observation, but interaction.

As for Gibson (1986), visual perception is based on the information present in light, created by the structure in the ambient optic array. This information is directly linked to the environment in an unchanging way, so that a certain piece of information will always specify the same thing about the environment, and vice versa. Whilst Ecological Perception has been criticised for its lack of neurological content, it is interesting to note that the V1 areas of the brain, activated for particular detection functions within scene processing, seem to respond directly to the information present in the light, prior to any form of processing or conversion (for a breakdown of the physiology in scene perception see Park and Chun, 2014). Whilst some basic aspects of visual perception are present at birth, the perceptual system undergoes self-driven development which allows for more complex processes such as spatial perception to emerge, as evidenced by the visual cliff (Gibson and Walk, 1960; Walk and Gibson, 1961). This development involves learning what the structure in the ambient optic array specifies and how our movement relates to it (Gibson, 1986: 55; Nöe, 2004: 59).

The development of this sensorimotor knowledge is rooted in visual kinesthesis (the knowledge of movement from the flow of the ambient optic array and the structural change in the environment), and in physical proprioception, (the perception of what actions your body is taking). The resistances offered by the environment affect these actions, just as our actions affect the environment (Hurley, 2001). The perceptual system is thus based on a loop, which contains proprioception, visual kinesthesis and the environment, all of which feedback to the brain informing it of the success of an action taken and its results on the visual field. This information is then used to formulate further plans of action, and over time the laws
governing the interaction of movement and change in stimulation are discerned, creating the unconscious sensorimotor knowledge Nöe (2004) proposes.

Given our genetic and physiological similarities, it is likely that perception starts from the same point in all anatomically modern humans. Indeed certain aspects of perception even seem to be constant across different species. This does not preclude divergence during perpetual development; the plasticity of the brain may mean that this is affected by culture. However, given perceptual constants and environmental structure which, in terms of physiological responses at least, contains much the same sorts of stimuli, we might posit a reduced impact of culture.

Since humans all relate to the environment through the same unchanging rules of stimulation transformation and invariance, we will all develop the same sensorimotor knowledge and thus a comparable perceptual process. The structure in light, the active role afforded the environment in perception, and ability to provide information about other parts of itself (like the blind person’s stick), reduce the processing power the brain requires. It does this by supplying meaningful contextual information, rather than raw data such as wavelengths and intensity of light. As Michotte (1991:65) and Michaels and Carello (1981:69) noted however, it is possible for people to have different perceptions of the same thing and for individuals to perceive differently at different times, as they can attend to different information in the array.

This difference in attention relates to the current situation, one’s goals, and one’s knowledge base; all elements key to the understanding of affordances. As perception is fundamentally a process involving the environment and the body, it is possible to directly perceive affordances in the environment (Gibson, 1986). The physical attributes of the world and the affordances they offer for a particular type of animal can be perceived by an individual and will be broadly the same as another individual with the same body type. It is therefore likely that two able individuals of the same species will perceive the same lower order affordances in an environment and be able to identify a number of the same higher order affordances.
To summarise, Ecological Motor Theory asserts that perception is an extended process, with the world playing a key role in our perception. The environment responds to our interaction with it in a lawful way, allowing the development of a consistent and reliable perceptual process. At a basic level, visual perception is the same across individuals with the same body type, since they engage with the world in the same way, and it offers the same lawful, structured feedback. However, there is still the possibility of divergence in perceptual content and the identification of action opportunity. This is caused by differing situations, intentions and cultural knowledge bases which all bring additional contextual information. According to Ecological Motor Theory, an animal will visually perceive the world in much the same way as any other with the same basic attributes, and be able to identify many of the same affordances. However, that which depends on prior cultural knowledge or on cognition may differ between individuals. Two people may both identify a post box as a place of storage and a thermal vent as source of warm air, but only one might recognise that the post box affords posting a letter and the thermal vent affords gaining height for a bird. This synthesis would seem to be the most appropriate perceptual theory to adopt, based on its ability to meet the challenges identified in Section 2.2 and its support through experimental evidence.

3.5 Conclusions from Perceptual Research Reviews

Experiments by Bornstein (1990), Schwartz, Campos and Baisel (1973), and Walk (1981) all suggest that certain fundamental elements of visual perception develop early enough in infants to be considered uninfluenced by cultural or environmental factors. Whilst the work of Riesen and Aarons (1959), and Held and Hein (1963) demonstrate the importance of self-directed exploration of a structured and varied environment in developing proper visual perception, real world experiments do not suggest any differences in perception caused by the environment in which one lives. Segall et al. (1966), Stewart (1974) and Deregowski (1980) have all argued for the effect of the environment on perceptual development, whilst studies by Allport and Pettigrew (1957), McPhearson (1965) and Ahluwalia (1978) all suggest otherwise. Some such as Deregowski (1980) have also posited education as a factor in perception of illusions and pictures. Whilst the perception of illusions may tell us something about perception in ambiguous situations, and the skills employed in perceiving pictures may have some overlap with spatial perception, it seems unlikely that a higher level of education
would lead one to be more skilled in visual perception. Skill in attention, attending to a wider range of things and detection of higher order affordances could be of course. There is also some evidence that language may affect perception (Wolfe et al., 2015). Whilst the factors of environment, language and education are evidently linked to culture, only work by Hudson (1960; 1962a; 1962b; 1970), and that following on from his, has explicitly argued for a cultural impact upon perception. Given the serious problems with this work and the contrasting findings by a number of other studies it seems unlikely that the results are correct (Campbell-Bell, in preparation).

There therefore seems to be little evidence in perceptual experimentation for an explicit cultural effect on the basic processes of visual perception. Instead it is ancillary factors closely associated with culture (environment, education, language) which may have an effect. There is no consensus amongst the cross-cultural research community, but the weight of evidence, especially given Davidoff’s (1975) argument about the difficulty of proving a negative, might suggest that culture, and culturally associated factors, do not have a significant effect on the development of visual perception. Combined with the findings of experiments by Bornstein (1990; Bornstein et al., 1976), Gibson and Walk (1960; Walk and Gibson, 1961), Held and Hein (1963), and Schwartz et al. (1973), along with the theoretical synthesis proposed above, it may be argued that environmental visual perception occurs the same way in all humans. This means that the perception of people of past and modern cultures may be the same in a landscape context. Of course we cannot ignore Michotte’s (1991: 65) point that different things can be attended to in the same scene, or that socio-cultural niches may affect what affordances are perceived. This is especially important in a complex perceptual environment such as a landscape.

The evidence discussed so far then is promising for landscape archaeology; it suggests that our attempts at interpreting landscapes may be valid. However, there is still further evidence required to support this assertion. None of these studies have looked into the perception of the landscape itself and none of the more ecological experiments have been explicitly cross-cultural.

At this time we can be confident about the processes behind the basic elements of (landscape) perception; shape, position, distance etc. One can also propose, given the
experimental evidence and the balance of theoretical arguments (including their synthesis into Ecological Motor Theory) that these processes occur the same way in all people, regardless of cultural or environmental variation. However, the kinds of interpretations that archaeologists make about landscapes go beyond these basic processes. Visuo-spatial approaches build on these elements for discussions of spatial patterning for example, and so understanding this kind of landscape scale perception, and to what extent it may vary between archaeologists and the cultures they study, is vitally important for archaeological landscape studies. This research must therefore seek to undertake a perceptual experiment which deals directly with landscape perception and the variation caused by cultural background.

The development of this experiment and a defence of its applicability to archaeological research through the use of Perceptual Uniformitarianism will be the focus of Chapter 5. A large body of evidence from psychological research has been discussed so far, but in order to better inform the design of this experiment, and further the aim of this thesis, it would be prudent to look at archaeological evidence for how past people perceived. So far only evidence from a modern context has been reviewed, and it would be remiss not to seek out evidence for past people’s perception in order to undertake a comparison. Chapter 4 will therefore look at a range of evidence which can be explored to help us understand how past people perceived, and to what extent this is the same as modern people.
4 Archaeological Evidence for Perception

4.1 Introduction

The discussion in Chapters 2 and 3 has offered insight into the process of visual perception, however there are still a number of key questions which remain unresolved. Not least of these is the issue of cross-cultural perception and how this relates to past people. Given that research into modern cultures has, as yet, failed to adequately resolve this issue, and given that we do not have direct access to the cultures of the past for the purposes of experimentation, it would be prudent to turn to the archaeological record. By analysing evidence which may pertain to characteristics of visual perception in past cultures, we may gain insight into the central research question. Even if clear evidence for visuo-spatial perception cannot be found, a general picture of perception that either differs from or conforms to that presented by modern research would be of use in understanding the issue of whether we are collecting the correct data. This chapter therefore aims to fulfil the second aim identified in Chapter 1, to discern what may be directly learnt or inferred about past peoples’ perception from archaeological evidence.

The preceding chapters have offered a range of evidence pertinent to understanding visual perception, however, not all of this can be applied directly to understanding the archaeological record. Archaeological evidence will be open to discussion in the context of this evidence, but definitively demonstrating how certain things may have been perceived by past people is impossible. Some aspects of visual perception which have been studied in psychological work such as colour, two-dimensional representations, Gestalt principles and illusion could be explored archaeologically though. This may even allow us to gauge the extent to which the perception of past people may match our own. Each of these areas will be looked at in this chapter.

Various studies have demonstrated that colour perception is cross-cultural, but that language can aid in distinguishing similar hues (Gordon, 1989; Bornstein, 1990; Wolfe et al., 2015). We may therefore find that past people perceived colour in the same way as ourselves, however, there being no direct way to test such an assertion, the best we can do is to look for structured use of colour in past societies and the formation of associations between multiple
distinct hues that would be familiar to us, or conversely apparently similar treatment of hues which we would consider different. Examples might include the structured use of coloured stone in construction or the use of appropriately coloured pigments in representations of things. Two-dimensional representations may offer a broad range of possibilities for understanding past perception, since they are an aspect of material culture for which we have a broad range of examples. Its relation to visual perception has also been extensively studied in a modern context. Two-dimensional representations of three-dimensional objects and scenes, such as the Necker Cube, the shapes in Figure 3.3, or the depth cues in Figure 3.1 may all show up in the archaeological record, as may representations of illusions. All of these would give good indications of the character of past people’s visual experience and understanding. Finally, the identification of Gestalt Principles in depictions would reinforce the idea that these are elements of the perceptual process common across cultures. All of this could suggest a degree of commonality in spatial perception between modern and past people.

An analysis of the spatial patterning of landscapes and built spaces may offer insights, by showing similarity in structure to modern spaces, demonstrating Zubrow’s (1994) universal cognitive principals or showing shared concepts of distance. However, given that the question at the heart of this thesis is the validity of this visuo-spatial data, it would not be appropriate to make use of it in the answering of the research question. Depending on the outcome of the perceptual experiment, such ideas could then be explored.

One method to gain an understanding of how past people understood their landscapes and the structure of space, without resorting to collecting visuo-spatial data about a landscape, is to make use of the material culture that they produced which has an undeniably spatial character to it. Whilst there are many hypotheses concerning the spatial layout of landscapes and built environments, these cannot be categorically proven to have had a specific spatial intention behind them. Material culture such as maps and plans however are inherently spatial, in that they are designed to represent space and convey information about it; whether that be physical, cosmological or mythological space. Given the focus of this research on visuo-spatial approaches to landscape, and the possibility of investigating spatiality through materials created by past people themselves, it seems logical to start here. The presence of
map making within a culture suggests a certain way of thinking about space and certain characteristics of visuo-spatial perception in their creation and use, as well as the ability to abstract ground based perception to a top down view. Detailed analysis of the content and process of creation of maps may give further insights into how past people perceived the spatial relations of their landscapes, especially visually, given that maps are most often a visual representation. This would also give insight into what past people thought important to record. This would be an extensive piece of work in itself however, and so has not been undertaken for this thesis.

Maps are often associated with top-down views, and so the implications of material culture seemingly created for view from above should be considered alongside ancient maps. Examples such as the Nasca lines not only suggest an aerial viewpoint, but are also evidence of clear spatial understanding given their large scale and coherent design. Having analysed maps then, this chapter will move on to look at other aspects of material culture which may give insight into the nature of past peoples’ visual perception. The main aim here will be to explore in more detail some of the possibilities already raised. This will include the identification of specific examples and a discussion of what they may mean for visual perception. These examples will be sought in literature about inherently visual materials (geoglyphs, cave painting, rock carving etc.), but an exhaustive search of the archaeological evidence is beyond the scope of this work. There are therefore some constraints on what material can be discussed. There is a tendency in rock art literature, for example, to discuss and depict the same example in many different publications. This is a result of it having been selected to make particular points in relation to the objectives of that research; these objectives do not match those of this thesis. There are therefore likely many examples of interest which have not been identified here due to their lack of widespread reproduction.

4.2 Maps

Although there is a large body of cartographic history literature, historic maps have received relatively little attention in archaeological research, and there tends to be a great deal of scepticism about them. Concerns such as those of Thomas (1993) have already been noted; whilst some argue that we should not assume that past people could conceive of the world in the same way as modern individuals, we might equally argue that there is no reason to
deny them our faculties. This section presents evidence of mapping from outside a modern western context, demonstrating that past people were able to abstract to a top down perspective and that they thought about and represented spatial relationships in some way. This may suggest that they conceptualised and perceived space in a similar way to modern, western people.

Perhaps one of the most contentious issues in historic cartography is what constitutes a map (Harley and Woodward, 1987a). There are many cultural particularities associated with maps which have developed over their long history, but fundamentally a map is an attempt to store, articulate and communicate concepts and facts with a spatial dimension (Harley and Woodward, 1987a: xviii). A map may not necessarily depict a real landscape, but instead an imagined, idealised or mythical one (Harley and Woodward, 1987a; Woodward and Lewis, 1998a). They may also have considerably more meaning attached to them than a simple depiction of space; there are many ways in which a map can be value laden or politically charged. Without understanding their historical, social and scientific context it is impossible to fully understand a map (Harley, 1987), and for much of history accurate knowledge of this context is lacking. What is interesting for any study of spatiality though is that maps are a graphic depiction of spatial understanding; this depiction is the foundation of the map and is what is relevant to visual perception.

Even with an agreed definition, identifying maps can be problematic; it requires finding potentially cartographic images and assuming the maker’s intent was the portrayal of spatial relations (Delano-Smith, 1987: 61). Their identification is difficult due to unfamiliarity with what is being depicted and the infinite potential in symbology, but by applying strict criteria of composition, appropriateness and frequency of symbols some headway has been made (Delano-Smith, 1987: 61-62; Harley, 1987: 3). Distinguishing between a picture and a map of a place, however, is difficult, as this is not a matter of form but rather the intent of the creator (Delano-Smith, 1994: 1). Delano-Smith (ibid.) therefore argues that we must simply look for images which could be cartographic.

The following discussion is structured broadly chronologically, though with some variations for readability. Details of each image discussed can be found in Table 4.1.
### Table 4.1- Maps/Images Discussed in Chapter 4

<table>
<thead>
<tr>
<th>Figure</th>
<th>Possible map details</th>
<th>Location</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Town map of Çatalhöyük</td>
<td>Konya Province, Turkey</td>
<td>6200 BC</td>
</tr>
<tr>
<td>4.2</td>
<td>Picture map</td>
<td>Penalsordo, Badajoz, Spain</td>
<td>Possible Upper Palaeolithic</td>
</tr>
<tr>
<td>4.3</td>
<td>Picture map</td>
<td>Mezhirichi, Ukraine</td>
<td>Possible Upper Palaeolithic</td>
</tr>
<tr>
<td>4.4</td>
<td>Village picture map</td>
<td>Cangyuan, Yunnan, China</td>
<td>Unknown date- Prehistoric</td>
</tr>
<tr>
<td>4.5</td>
<td>Petroglyph plan</td>
<td>Murgur-Sargol, Sayan Mountains, Siberia</td>
<td>Unknown date- Prehistoric</td>
</tr>
<tr>
<td>4.6</td>
<td>Landscape map</td>
<td>Abauntz cave, Navarra, Spain</td>
<td>11,660 BC</td>
</tr>
<tr>
<td></td>
<td>Topographic figure</td>
<td>Valtellina and Caven, Italy</td>
<td>Unknown date</td>
</tr>
<tr>
<td></td>
<td>Topographic figure</td>
<td>Ulug-Khema Valley, Russia</td>
<td>Unknown date</td>
</tr>
<tr>
<td></td>
<td>Topographic figure</td>
<td>Aussois, France</td>
<td>Iron Age</td>
</tr>
<tr>
<td></td>
<td>Topographic figure</td>
<td>Val Cenischia, France/Italy border</td>
<td>Iron Age</td>
</tr>
<tr>
<td>4.7</td>
<td>Topographic figure</td>
<td>Monte Bego, France</td>
<td>Neolithic- Iron Age</td>
</tr>
<tr>
<td>4.8</td>
<td>Topographic figure</td>
<td>Valcamonica, Italy</td>
<td>1000-500 BC</td>
</tr>
<tr>
<td>4.9</td>
<td>Topographic figure</td>
<td>Valcamonica, Italy</td>
<td>Neolithic- Iron Age</td>
</tr>
<tr>
<td>4.10</td>
<td>Topographic figure</td>
<td>Valcamonica, Italy</td>
<td>Neolithic- Iron Age</td>
</tr>
<tr>
<td>4.11</td>
<td>Topographic figure</td>
<td>Monte Bego, France</td>
<td>Neolithic- Iron Age</td>
</tr>
<tr>
<td></td>
<td>Miscellaneous plans of land, property, houses and towns</td>
<td>Babylon</td>
<td>2300 BC onwards</td>
</tr>
<tr>
<td>4.13</td>
<td>Plan of Nippur</td>
<td>Nuffar, Iraq</td>
<td>1500 BC</td>
</tr>
<tr>
<td></td>
<td>World Map</td>
<td>Yusufiyah, Iraq</td>
<td>600 BC</td>
</tr>
<tr>
<td>4.14</td>
<td>Turin Papyrus Map</td>
<td>Thebes, Egypt</td>
<td>1292-1189 BC</td>
</tr>
<tr>
<td></td>
<td>Cooking Vessel map</td>
<td>China</td>
<td>2100 BC</td>
</tr>
<tr>
<td></td>
<td>Graveyard map</td>
<td>China</td>
<td>323-315 BC</td>
</tr>
<tr>
<td></td>
<td>Anaximander’s maps</td>
<td>Greece</td>
<td>c. 610-546 BC</td>
</tr>
<tr>
<td></td>
<td>Portable maps</td>
<td>Greece</td>
<td>5th Century BC</td>
</tr>
<tr>
<td></td>
<td>Native American maps</td>
<td>North America</td>
<td>Prior to contact in the early 16th Century</td>
</tr>
<tr>
<td>4.15</td>
<td>Stick charts</td>
<td>Marshall Islands</td>
<td>Unknown date, likely pre contact in early 16th Century</td>
</tr>
<tr>
<td>4.16</td>
<td>Native informed map of the Caroline Islands</td>
<td>Caroline Islands</td>
<td>1722 AD</td>
</tr>
<tr>
<td>4.17</td>
<td>Native informed map of Ratak and Ralik Islands</td>
<td>Marshall Islands</td>
<td>1817 AD</td>
</tr>
<tr>
<td>4.18</td>
<td>Map of Polynesia informed by Tupaia</td>
<td>Tahiti</td>
<td>1769 AD</td>
</tr>
<tr>
<td></td>
<td>A Map drawn for Captain Cook by a Māori</td>
<td>New Zealand</td>
<td>1769 AD</td>
</tr>
<tr>
<td>4.19</td>
<td>Map of Belcher Islands by Inuit Wetallok</td>
<td>Canada</td>
<td>Pre 1910 AD</td>
</tr>
</tbody>
</table>
Maps have been associated with a wide range of societies (Harley, 1987), however, they are more readily identified when accompanied by explanatory writing. It is also probable that researchers are more disposed to accepting the work of literate, organised societies as maps. The full extent of map making may therefore be widely underestimated.

The well-known wall painting at Çatalhöyük (Fig. 4.1) dated to around 6200 BC is often cited as the earliest example of a map, and is unusual in having precise dating and a well-documented context (Delano-Smith, 1987: 73). However, its interpretation as a map of Çatalhöyük with the volcano Hasan Dağ in the background (Mellaart, 1967) has been questioned, and it is increasingly common to accept that this painting represents a leopard skin and a geometric pattern, both of which are common features in Çatalhöyük art (Meece, 2006). Evidence of early mapping must therefore be sought elsewhere.

Utrilla et al. (2009) note that a number of possible Palaeolithic maps from Eastern Europe have been found and discussed at some length (see Marshack, 1979; Klíma, 1991; Kozlowski, 1992; Züchner, 1996; Svoboda, 1997; 2007), whilst those found in Western Europe have been dismissed. Whether those in the west have received a greater degree of sceptical critique, or if there are simply more examples of map like depictions from this period in Eastern Europe, it is difficult to tell without a more extensive review of the foreign language literature. Delano-Smith (1987) discussed a number of European and Near Eastern Upper Palaeolithic ‘picture maps’, relatively simple scenes in which top down and profile views are mixed, and events seem to take precedence over space (Figs 4.2 and 4.3). There are also a number of examples of early maps from Asia (Figs 4.4 and 4.5), though fewer than from Europe, perhaps due more to the limited literature on rock art, given how extensive rock art actually is in Asia (Delano-Smith, 1994). These picture maps tend to depict small areas of space, and so might best be labelled as plans.
**Figure 4.2** - Possible Upper Palaeolithic picture map from Penalsordo, Badajoz, Spain. A cave painting interpreted as two people within a hut or enclosure (Breuil, 1933).

**Figure 4.11** - Possible Upper Palaeolithic picture map from Mezhirichi, Ukraine. An engraving on mammoth tusk interpreted as four riverside dwellings and fishing nets within the river (James and Thorpe, 1995).

**Figure 4.12** - Picture map of a prehistoric village which obeys the rules of topology from Cangyuan, Yunnan, China (After Wang, 1985: 35).
These are presented as proto-maps which have yet to take on the necessary qualities to become what we may reliably consider maps, but which nonetheless represent cartographic thinking (ibid.). However, even this early distinction may be separating off too much of the material through an over use of our modern western perspective. In non-western societies places are often inextricably linked to the events that took place there, and so names and representations of those places are directly affected by those events (Delano-Smith, 1994: 2; Woodward and Lewis, 1998b: 539); a well-known example is some of the Australian Aboriginal Dreaming art (David, 2002). The potential for scenes to depict both time and space is also recognised in Scandinavian rock art (see for example Helskog, 1999; Gjerde, 2013). Judging these representations as ‘picture maps’ rather than full maps because they emphasise events may therefore be a false distinction, the events themselves being an important factor in delineating space.
Utrilla et al. (2009) discuss an example of what they see as a true Palaeolithic map from Navarra, Spain. In the Abauntz cave, two engraved stone blocks were found in a context dated to 13,660 cal BP, both of which are covered in an array of superimposed engravings (Utrilla et al., 2009: 100). Many of those on Block 1 are interpreted as representing a map of the area around the cave, including the mountain opposite, rivers and a gorge (Utrilla et al., 2009: 107) (Fig 4.6). These carvings are interpreted as either a story of a hunt, due to the representations of ibex, or as a map left for future use (Utrilla et al., 2009: 110). The accuracy of this second interpretation is hard to validate without visiting the landscape itself, and the sheer quantity
of marks on Block 1 mean that it is not possible to be certain what constitutes a single composition. If this interpretation is correct however, then Block 1 represents an advance on the Palaeolithic ‘picture maps’ discussed by Delano-Smith (1987: 62), in that it is a detailed plan of a known landscape. Of course given the importance of events in the understanding of space, there is no need for the two interpretations to be mutually exclusive.

The Palaeolithic still offers nothing that we can be certain is a map, but for later periods there are more convincing bodies of evidence, still within a pre-literate context. The first of these are over two hundred carvings in the Alps which have been interpreted as depicting topographic features such as tracks, fields and huts (Delano-Smith, 1987; Arcà, 2004). These topographic figures are concentrated in Valcamonica and Monte Bego, and have been dated, through analysis of superimposition and the identification of known motifs/artefacts, mostly to the Chalcolithic and Iron Age, though some are attributed to the Neolithic (Arcà, 2000; 2004: 329, 336; Fossati, 2002). Such methods cannot definitively establish date, and so these topographic figures may belong to a later period, but there is nothing to suggest that they are not prehistoric in origin. Similar engravings have also been found at: Valtellina and Caven, northern Italy; Ulug-Khema Valley, Russia; Aussois, France; and Val Cenischia, on the French/Italian border (Arcà, 2000: 31). Topographic figures at the latter two have been dated to the Iron Age (ibid.).

The figures are made up of sub circular forms, pecked surfaces, rectangles and irregular connecting lines (Fig. 4.7). Delano-Smith (1987: 67-68) notes that many archaeologists are unwilling to accept them as maps, a common objection being that many are distorted to fit the rocks that they are on. Delano-Smith (ibid.) dismisses this since “the key property of topology… is the preservation of continuity but not shape” and we should not judge them based on then unformed principles of Euclidean geometry. Some of the topographic figures are very simple, containing fewer than six parts, others, containing more than 18 parts, are labelled complex maps and are the most convincing (for example Figs. 4.8-4.10), though there are fewer examples (Delano-Smith, 1987).
Figure 4.23- Simple topographic figures from Val Fontanalba, Monte Bego (Bicknell, 1913). Public domain

Figure 4.24- Bedolina R7 Seradina-Bedolina, Capo di Ponte (Maretta, 2013).
Figure 4.25- Complex topographic figure from Valcamonica (Priuli, 1985).

Figure 4.26- Bedolina 1, a complex topographic figure from Bedolina, Valcamonica (Footsteps of Man Archaeological Cooperative Society, used under Creative Commons Licence CC-BY-SA-3.0). Non-contemporary overlying and underlying carvings have been removed in the version by Beltrán Lloris (1972).
These topographic figures could be an attempt to better depict spatial relations in response to an increasingly complex society, or it could be a reflection of the types of views afforded from some of the engraving sites, making them another form of picture maps, just with a unique viewpoint. Whilst those at Valcamonica overlook a cultivated valley, those at Monte Bego are relatively inaccessible and distant from any areas that might be depicted (Delano-Smith, 1987: 80). The Monte Bego Village map for example (Fig. 4.11), is surrounded by an entirely rocky landscape (Arcà, 2004: 323). These particular maps are not therefore just a depiction of what is seen. As immobile pieces of rock art, perhaps we should not expect them to be; one does not necessarily need a map of an area which they have an aerial view of. However, it would also seem to be of little use having a map of features some distance from them in the mountains; such information would not help navigating to or around them. Maps are not just about conveying spatial relations though; the Valcamonica and Monte Bego maps may therefore be conveying information which allows the observer to understand something about the area. Equally we should be wary of projecting our utilitarian concepts onto these figures as they may have been created for symbolic or artistic reasons, whilst still having an element of mapping intent. Based on Arcà’s (2000) interpretation as representations of agricultural landscapes, Fossati (2002) suggests that they may result from ritual activity for sanctioning agricultural use of the land or for its organisation.

Figure 4.27- The “Monte Bego Village” Map. Delano-Smith reinterpreted it as four simple topographic figures (b-e) and one complex one (a) (Bicknell, 1913). Public domain

131
A greater understanding of these topographic images might be gained through attributing them to a culture through excavation evidence from surrounding areas. If material culture bearing similar markings from different contexts were identified, one might argue that these are simply examples of a particular style. One might also look to the landscapes around the figures for clues as to their meaning. It might be that a pattern of features in these topographic figures matches a pattern of extant natural features in these landscapes. Whilst such identification would increase confidence in their interpretation as maps, a failure to match features does not mean that they are not; they could be mapping features that simply do not exist anymore, or given the broad range of things which maps can represent (Harley and Woodward, 1987a; Woodward and Lewis, 1998a), things which never existed physically in the first place.

Marretta (2013) has questioned whether these figures are in fact topographic representations. Whilst some compositions, such as that on Bedolina R7 (Fig. 4.8), seem to follow the morphology of the rock, others stretch onto parts of rocks which could not be representative of actual topography and their related cultural features (Maretta, 2013: 346-348). Although some have used the incorporation of rock morphology to support the topographic interpretation (see Chippindale and Baker, 2012; Zefinetti and Peverelli, 2009) Marretta’s objection is only valid if we assert that figures must make use of the rock shape in order to be topographic in nature. Given the improbability of finding a rock that matched the piece of landscape one wished to depict, this would be an unlikely approach for past people to have taken. Marretta (2013: 347) also asserts that certain figures, such as one in Redondo, where lines extend from quadrangles to nothing means that it is unlikely that these are maps. However, these figures may represent certain features, such as manmade ones, and may join with unmarked natural features, they may represent only the most used or important parts of certain routes, or it may simply be that certain features and locations did not need marking on a map. Marretta (2013: 347) also argues that, unlike an actual settlement, paths never seem to directly connect nearby symbols thought to be buildings, but this idea relies on there not being a prescribed way to approach a building, no boundaries being in the way, any such routes being used regularly enough, and the spatial patterning of settlements and relations being such that neighbours might have cause to visit each other.
Marretta’s (2013: 347) final objection is that figures such as R12 seem to show features which have a particular orientation, in this case lines below rectangles believed to be buildings. If there is an above/below orientation, Maretta argues, then the representations cannot be from a single point in the sky, and further, this is a view particular to our society (ibid.). However, modern maps are not drawn from a single point in the sky, but every point; they are devoid of perspective. Drawn from a point in the sky, these figures would have perspective, and thus above/below orientations. It is also possible that the lines represent features which were built in a consistent direction across a settlement e.g. always to the South. Further to this, one need only look at a modern map to see symbology that is consistently represented in the same orientation, irrespective of reality. Outside of considerations of maps, Section 4.3 will demonstrate that abstracting to top down views is not a modern western peculiarity.

A further argument in favour of a cartographic interpretation is the figures similarity to crop marks. By their nature, crop marks are simplified line and area representations of complex anthropogenic features, and in mapping such features on a material which offers a great deal of resistance, such as stone, we might expect representations to take on a similar simplified form. Figure 4.12 shows a number of examples of aerial photographs and transcriptions of crop marks which could be likened the topographic figures of Valacmonica and Monte Bego.

Despite any assertions otherwise, the Palaeolithic and later pre-historic “maps” are still debateable; unless they can be unquestionably linked to real landscapes these interpretations cannot be confirmed. Given the nature of landscape change and the archaeological record, this is unlikely. In the Bronze Age, however, there are annotated maps which can be directly linked to actual places (Millard, 1987). From c. 2300 BC Babylonian scribes created plans of land, houses, temples and towns with features such as walls, streets and rivers marked in plan (Millard, 1987: 109). One particularly impressive tablet from 1500BC shows a plan of Nippur, including a temple, the river Euphrates, canals, city walls, gates, labels, and measurements (Fig. 4.13) (Millard, 1987: 110). Larger maps are less common, perhaps due to the difficulties of working on clay tablets which were rarely larger than 20cm², and the fact that routes tended to follow rivers, coasts and well defined passes (Millard, 1987). Two examples are a diagrammatic map from Nippur which depicts nine settlements, and the widely known...
Babylonian world map from 600BC; although this is more for demonstrating ideas in the accompanying text than depicting spatial relations (Millard, 1987: 111-112).

Figure 4.33 - Examples of crop marks which resemble topographic figures. A and D: Fenner and Dyer, 1994; B: A section of Figure 3; C: Historic England, 2018.
Although even rarer, there are also maps from Ancient Egypt, such as the Turin Papyrus (Fig. 4.14) from the reign of Ramesses IV. This depicts roads and wadis running through a mountainous region with annotated route destinations, distances and geological information, plus landmarks such as wells, a stela from the 19th Dynasty and a temple (Shore, 1987: 122-123; Harrell, 2008). It also includes a key (ibid.). Other examples show building plans labelled with measurements, but in general, the Egyptians seem to have preferred descriptive text to maps and plans (Shore, 1987).

In China, the first evidence of mapping comes from a cooking vessel dated to 2100 BC, with the next extant example being a plan of a graveyard found in a tomb from 323-315 BC (Black, 1997: 2). Other early examples are referenced in texts, and from the Western Han Dynasty (206 BC- AD 9) onwards maps become far more common (ibid.).

During the archaic and classical periods in Greece, map making underwent considerable development as scholars undertook cartographic research (Harley and Woodward, 1987b). Much of the earliest work is known only from later descriptions, and it is believed that many of the earliest advances were made by Anaximander in the 6th century BC (ibid.). These descriptions constitute only a small number of the maps in circulation; numerous references show that by the 5th century BC maps and plans were portable, familiar to a wide audience and were regularly put to practical use (Harley and Woodward, 1987b; Harley and Woodward, 1987c). The result was that within a few centuries Greek scholars had created a standardised geographic way of thinking about the world (Harley and Woodward, 1987d).
Figure 4.35 - The Turin Papyrus as reconstructed by Harrell and Brown (1992), Public domain.
Whilst there are no examples of images created by non-literate societies from the archaeological record which can be interpreted as maps with complete confidence, the ethnographic record is full of examples. These demonstrate the potential of non-literate societies to create maps.

There is ample evidence of Native American mapping, including creating their own maps and sharing geographic information, between themselves and with Europeans, extending the maps of the latter to cover areas which they had yet to explore (Lewis, 1998: 180). Whilst the accounts and the resulting maps come from early contact, the ease with which Native Americans added to existing maps and their extensive use of them in this period would suggest that they were already very familiar with the concept. Lewis (1998: 182) even goes so far as to state that Native Americans had used maps to make sense of the world beyond an individual’s direct experience “for generations, centuries, probably even millennia before contact.”

The stick charts of the Marshall Islands are mnemonic and teaching aids which portray the effect of islands upon ocean swells (Finney, 1998). These are particularly interesting as a form of mapping specific to the environment, which evidentially starts from very different principles than western approaches (Fig. 4.15).

Figure 4.36- Marshallese Rebbelib stick chart. This chart represents the majority of the Marshall Islands. The long curving sticks represent the eastern and western ocean swells, the chevrons show swells interacting with islands and the horizontal sticks distances at which islands can be detected (Winkler, 1901; Museum für Völkerkunde, Berlin). Public domain
There are other examples of mapping which are distinctly different to our modern western conception too. Star compasses are spatial representations of the sky and the main ocean swell directions, which are used to learn how to navigate between islands (Finney, 1998). These are relational, not absolute representations of space, and so a separate mental map is required for each starting location. This is a distinctly different approach to navigating and understanding space to western mapping, one no doubt created by the particular circumstances of living in the Pacific Islands.

Early European explorers recorded indigenous peoples readily marking out the locations of island systems in a more typical fashion, including the Marshall Islands and the Caroline Islands (Finney, 1998: 452-454) (Figs. 4.16 and 4.17). Of particular note are Tahitian navigators who had knowledge of islands covering an area of more than a thousand miles, resulting in charts such as Figure 4.18 (Finney, 1998: 446-451). For islands more distant from Tahiti there are some quite serious errors, this may be due to problems in communication (ibid.), or a lack of exact knowledge. For those closer to Tahiti however, the placement of the islands is very good (ibid.). The voyages of Captain Cook also brought him into contact with Māori, and multiple accounts detail one of them drawing a map of New Zealand for him (Barton, 1998: 501). Barton (1998: 501, 531.) suggests that their understanding of what was being requested, the speed with which it was carried out, and the use of symbols to convey information, despite no exposure to European maps, suggests that the Māori were already familiar with map making. Whilst there are no extant examples of pre-contact Pacific Islander maps, this does not mean that there were none; as noted in Chapter 1 they may well have been produced on perishable materials or have only been temporary in nature.

Early contact with the Inuit also showed that mapping was a pre-existing element of their culture, with concepts of size and alignment well established (Lewis, 1998). Most of their maps were ephemeral however, and so little survives apart from maps made or extended for westerners (ibid.). One surviving example, not made at the behest of a westerner is a map of the Belcher Islands drawn prior to its creator meeting Robert Flaherty in 1910 (ibid.: 165) (Fig 4.19).
Figure 4.45- Juan Antonio Cantova’s map of the Caroline Islands, produced in 1722 from information provided by natives of the islands that had landed on Guam, where Cantova was stationed (Du Halde, 1709-1743). Public domain

Figure 4.46- Chart produced by Otto von Kotzebue in 1817 covering the Ratak and Ralik chains of the Marshal Islands. The information was sourced from navigators from the Ratak island chain drawing in the sand and communicating with gestures (von Kotzebue, 1821). Public domain
Figure 4.55- Chart produced by James Cook displaying the geographic knowledge of the Tahitian Tupaia (British Library). Public domain

Figure 4.61- A) Wetalltok’s map of the Belcher Islands. These islands had been mostly forgotten about by Europeans, and the accuracy was doubted (American Geographical Society Collection, University of Wisconsin-Milwaukee Library). Public domain.

B) Satellite image of the Belcher Islands, demonstrating the map’s accuracy (Google, Landsat/Copernicus).
These are just a few of many cases (Harley and Woodward, 1987a; Harley and Woodward, 1994; Woodward and Lewis, 1998a) which suggest a shared understanding between westerners and the native inhabitants of different areas around the world about spatial relations and their representation in abstract form. Whilst they do not make use of coordinates or measure distance in units of space, they share a common topology which Woodward and Lewis (1998b: 538) see as far more important. This includes concepts such as linearity, centre, periphery, connectedness and contiguity (ibid.). The last of these is of note as one of Zubrow’s (1994: 110) proposed universal cognitive principles. The result of this apparent shared understanding is the creation of maps that can be readily understood as accurate reflections of the world. Whilst this material cannot be used to make direct remarks about the nature of the more distant past, it can establish certain principles which can be used when looking at archaeological evidence.

As noted above, map like images in the archaeological record are often only accepted as representing true maps when in the context of complex literate societies (Harley, 1987). The body of evidence presented here however, demonstrates that complex mapping can in fact be the product of non-literate societies. The perspective view in picture maps needn’t be reason to dismiss them either; a perspective based view is still used in many maps today, such as tourist maps, to make it easier to identify key features. Such maps also often do not use abstract symbology or adhere to a strict scale, compressing or stretching certain areas to fit. If modern mapping techniques are not utilised in all modern maps, why should we dismiss past images which do not make use of these techniques? In actual fact, even within undisputed maps the principles of accuracy and rationality are fairly recent considerations around the world, and even now maps vary between countries (Harley, 2002: 844). Given these considerations, there is no reason to dismiss the early examples of map like images out of hand; mapping really may have a history as long as Utrilla et al. (2009) and Delano-Smith (1987) suggest.

This section has aimed to give an overview of mapmaking in order to show the extent to which such spatial reasoning can be found throughout history and across the world, and to serve as evidence of the similarity between spatial abilities of past and modern people. If the understanding of space through maps is much the same across different cultures and if these
maps reflect actual perception of spatiality, then the use of maps from archaeological contexts could potentially give us insight into past peoples and landscapes. Given the ethnographic body of evidence, we can posit, for example, that the concepts of linearity, centre, periphery, connectedness and contiguity were understood by past people who created maps, and so would be reflected in their understanding and modification of landscapes. A more in depth analysis of individual maps may prove fruitful in discerning the sort of spatial patterning that their creators recognised and considered important, and maybe even how they conceived particular elements of landscapes.

4.3 Geoglyphs

Geoglyphs are large scale images made in the landscape by either removing stones/sand, or placing stones, in order to make a coherent design which contrasts with the surrounding ground. It is their scale and complexity which makes them interesting for this research; they are orthographic (Gartner, 1998: 277) and often the designs are only fully visible from viewpoints which would not have been available to their creators (i.e. from above). Their creation would have required a clear conception of topology and the ability to abstract one’s perception to a view which was not possible. This process has much in common with the creation of maps and suggests certain spatial abilities which we would be familiar with in modern western society.

The most widely known examples are those from Nasca, Peru, which have a range of forms including abstract, geometric and biomorphic representations (Figures 4.20 and 4.21). The latter, measuring up to 125m long, cannot be seen in full at ground level, and there are no nearby elevated locations (Clarkson, 2014). Some are situated on low hillsides however, allowing them to be seen fully (ibid.). The Nasca geoglyphs are generally considered to date from around AD 400-650, though certain techniques suggest they could be up to 500 years earlier (Rink and Bartoll, 2005; Dorn et al., 1992). As well the elaborate designs, some geoglyphs form simple lines that may date from as early as 400 BC (Stanish et al., 2014). Some of these form V shapes which, at ground level, when facing away from the apex, appear to be parallel as they recede into the distance (ibid.). The angle between the lines is such that they compensate for the convergence normally perceived in two parallel lines. Whether this effect was deliberate or not one cannot say, though it is repeated multiple times.
Figure 4.62 - Nasca Geoglyphs. The condor, hummingbird, spider and monkey
If it was deliberate however, it represents an example of a real world perceptual illusion, similar to the Ponzo illusion. This is particularly interesting given the suggestion of some experiments that there may be a cultural or educational factor in susceptibility to the illusion (Deregowski, 1980: 47).

Another interesting example from Nasca is the so called labyrinth. This design is not visible at ground level, apart from those elements immediately around the viewer (Ruggles and Saunders, 2012). It has been argued, therefore, that it was made to be walked (ibid.); the same interpretation has been given for the other Nasca geoglyphs as well (Valenzueka and Clarkson, 2014). Certainly this design does not seem to benefit from being seen from above (Figure 4.21), and it displays the diverging line illusion noted above (Figure 4.22).

![Nasca Labyrinth Geoglyph](image)

*Figure 4.71: Nasca Labyrinth Geoglyph (Ruggles and Saunders, 2012).*

Geoglyphs are also present in other areas of the world and date from a broad range of periods. Examples are found in Argentina, Bolivia, Brazil, Chile, California, Colombia, England, Ohio and Venezuela (Clottes, 2002; Valenzueka and Clarkson, 2014). Some can be seen in
their entirety from ground level from nearby hills, or because they are on hillsides themselves, whilst others, due to their positioning and size or three-dimensionality cannot (Valenzuela and Clarkson, 2014). Given the fragile nature of many geoglyphs it is possible that they were far more common than is now recognised.

A final set of geoglyphs of particular note are those from the Har Karkom Plateau, Israel, which depict a number of animals and anthropomorphic figures (Mailland, 2012). Some of these clearly represent animals which were extinct in the area during the Late Pleistocene, such as elephants and rhinos (Figure 4.23) (ibid.). They are also located in the vicinity of Palaeolithic sites (ibid.). Mailland (2012) therefore interprets them as being Palaeolithic in date, making them the oldest known geoglyphs. Much like those at Nasca, these are best viewed from the air, due to their size (ibid.); they may therefore demonstrate that the ability to abstract from one’s ground level perception to a view as if from above was a perceptual skill present as far back as the Palaeolithic.

Figure 4.72- Nasca Labyrinth geoglyph illusion of parallel lines (Ruggles and Saunders, 2012).
4.4 Rock Art

Rock art, both in the form of painting and carving, has been the subject of extensive research; primarily focussing on the production, date and meaning. Hodgson (2000) and Dobrez (2013) two of the few to look at rock art in the context of visual perception, have focussed on the emergence, and perception of, rock art. However, here I wish instead to explore what rock art might tell us about how past people perceived. The meaning and, to some degree, intent behind the rock art, is outside the scope of this research.

The extensive research into two-dimensional depictions within a modern context offers plenty of material for comparison. As such, we may be able to find in rock art certain features which are indicative of how past people perceived their world. Such an approach is, of course, not perfect, as is the case for perceptual research through drawings and illusions, but as one of the limited sources of information we have, it is worth investigating.
There have been questions about representation in prehistoric art (Jones, 2013), with some arguing that we cannot assume that rock art: represents what it appears to depict (Lahelma, 2012); depicts anything (Cochrane and Jones, 2012); or even means anything (Card and Thomas, 2012: 121). Others meanwhile believe that rock art can have both representational and non-representational, or non-literal representational purposes (Helskog, 1999; 2004; Fahlander, 2012; 2013). Ultimately this debate is of no importance for this thesis; whether the art holds any particular meaning, or can be considered representational or not, its morphology can tell us about the process of creating the art. That process can in turn allow us to make deductions about the people that made it.

There are three main categories of features which give clues to perceptual traits, in a modern context, which we might look for in rock art. These are: drawing conventions and methods, which reflect real world perceptual experience, as well as a cultural norms; depictions that reflect perceptual tendencies, such as gestaltqualitäten and prägnanz; and illusions. Examples of these features represent a deliberate choice to depict something in this manner; such a choice shows understanding and therefore, likely prior perceptual experience of a similar kind. The depiction of many of these is what lead to their identification in the first place, and so one could reasonably argue that if the same kind of characteristics are present in rock art, then the population that created it shared some perceptual characteristics with modern western individuals.

In looking for these characteristics in rock art, one need not expect to find them in all examples from a particular context; most of the rock art reviewed did not contain the characteristics discussed below. Brooks (2017: 2) argues that we must be cautious about interpretations of occlusion in Palaeolithic art, for example, due to the fact that many images do not show it. However, just as art today does not demonstrate all of these factors all of the time, neither must prehistoric art in order to be used as an indication that past people were familiar with these concepts. It is equally important to note that an exhaustive search of rock art examples or even literature is well beyond the scope of this research. The rock art investigated has therefore been a product of what has been easy to access through print and online literature. There is a tendency in rock art literature to discuss and depict much of the same art in many different publications, this is a result of it having been selected to make
particular points in relation to rock art research. That research has particular objectives which
do not match those of this thesis, and so it is likely that there exists relevant rock art which
does not appear, or appears infrequently, in the literature. There may therefore be examples
in literature not examined here and others which have not made it into the rock art literature.

4.4.1 Drawing Conventions

Certain drawing conventions reflect our visual perception of the world, these include
occlusion, diminishing size of figures over distance, the convergence of parallel lines,
foreshortening and variations in optical texture. All of these relate to our perception of a
three-dimensional environment.

This review of rock art found no clear examples of the use of optical texture to depict size
or position, and no clear examples of converging parallel lines. These conventions may be
present in the wider body of rock art examples, may have been used in no longer extant art
(whether rock art or another medium), or may have never been used in ancient art.

Self-occlusion, i.e. an animal figure occluding part of its own legs is common, even in
Palaeolithic art, however, occlusion of other figures is supposedly rare (Halverson, 1992: 390;
Kennedy and Silver 1974: 318). Despite this, the most commonly found convention was inter-
depiction occlusion, which as discussed in Chapter 2, is a key aspect of our depth perception.
Occlusion could be a deliberate act with the intention of creating a coherent scene, or a side
effect of creating multiple depictions at different stages. It may be that certain images were
deliberately over worked, or that there was limited space on which to create images.
Definitively telling these cases apart without understanding the intent of the creators is
impossible, but there are certain factors that one can look for which may indicate that the
original intent was to depict visual occlusion, as perceived in a three-dimensional scene.

Where one image has clearly been painted/ carved over another we can assume that there
was no intention to depict occlusion. Where a depiction stops at or just before the boundary
of another depiction we can posit that this was a deliberate act. They may not have been
created at the same time, but the fact that the later depiction does not overwrite the earlier
one suggests a different intention than simply creating a new depiction. Identification cannot
rely on our modern expectations, and so the occluded depiction should be clearly identifiable

148
as a complete motif elsewhere, or be a form for which it is clear what the complete depiction would look like, e.g. an animal. Another example suggestive of deliberate scene creation through occlusion would be if one depiction both occludes and is occluded by another, since this is not an example of subsequent overworking.

One site which has multiple instances of occlusion is Chauvet Cave, France, the occupation of which has been dated to two phases, 37,000 to 33,500 and 31,000 to 28,000 years ago (Sadier et al., 2012; Quiles et al., 2016). The first example is relatively straightforward, and shows two rhinos with interlocking horns (Fig. 4.24). The rear horn of the rhino on the right is occluded, whilst the front horn occludes the other rhino. Given the composition of the image, this would certainly seem to be a deliberate depiction of occlusion.

Another example from Chauvet is the panel of the lions. Whilst there is some evidence of overworking in these images, there is also at least one instance of apparent occlusion, and possibly more, although the busyness of the panel makes it difficult to be certain (Fig. 4.25). Additional possible occlusions can be seen further to the left on the same panel.

![Rhinos with interlocking horns from Chauvet Cave](image)

*Figure 4.74- Rhinos with interlocking horns from Chauvet Cave (Detail of a larger image from Chauvet et al., 1996).*
A more definitive example of occlusion in Chauvet Cave is the so called herd of rhinos (Fig. 4.26). This shows a rhino (A) occluding six others, four of which can be seen above and to its rear, and two whose snouts can be seen to its front. This rhino is in turn occluded by two others (B and C). Rhino B also occludes C. Interestingly, A appears to have had its rear right foot erased in order to allow the occlusion by C; its foot can be seen as a faint lighter mark over C. The same may have happened to the rear leg of C. The final example from Chauvet Cave is a depiction of multiple horses and a lion in which at least three instances of occlusion can be seen (Fig. 4.27), and one instance of a horse being both occluded by and occluding another figure. Again, the busyness of the panel makes it difficult to interpret what lines belong to what depiction, meaning that there could be more instances of occlusion.
Figure 4.76 - Multiple occluding rhinos from Chauvet Cave (Adapted from Chauvet et al., 1996).

Figure 4.80 - A) Complex scene of occlusion from Chauvet Cave B) Green potentially occludes Red, Purple and Blue occlude Green, Turquoise occludes and is occluded by Green (Adapted from Chauvet et al., 1996).
More recent examples of occlusion in rock art come from Bronze Age carvings in Bohuslän, Sweden. This includes the famous Shoemaker and other images from the same area (Figs 4.28-4.30 show just a few examples). Each shows depictions which are occluded by others and which do not appear to have been over worked. Whist other depictions from the area overlap, as though overworked, or are oriented and scaled to fit into available space, the depictions which are occluded appear to stop just short of the lines of the occluding depiction. This suggests that they were created at the same time, or the occluded figure was created afterwards, and that there was an awareness of and deliberate intention to depict occlusion. In Figure 4.28 a ship is occluded by the body of the Shoemaker, in Figure 4.29 a ship is occluded by a person’s arms and in Figure 4.30 the head of one individual appears to be occluded, the arm of a second may also be occluded, and another individual occludes a boat.

Figure 4.84- Bronze Age Shoemaker carving from Bohuslän, Sweden. (Foundation of Bohuslän Rock Carvings, 2003)

Figure 4.88- Bronze Age Shoemaker carving from Bohuslän, Sweden. (Courtesy of Regina Hoff).
Figure 4.92- Bronze Age carving from Bohuslän, Sweden. (Foundation of Bohuslän Rock Carvings, 2003)

Figure 4.100- Simple and complex occlusions in San rock art (Adapted from Figure 75, Lewis-Williams and Dowson, 1999).
Examples of occlusion can also be seen in African rock art, in particular in South Africa, in the region currently occupied by the San. The wide array of rock art in this area has been posited to range in date from 26,300 (±400) BP to the 1890s (Lewis-Williams and Dowson, 1999). One particularly good example is a panel which includes multiple potential instances of simple and complex occlusion. Figure 4.31 shows a section of this panel in which the legs of the running figures at the top occlude each other, and the feet of the two animals on the left are occluded. Meanwhile, the bottom most animal has some complex occlusion interactions. The first involves a running figure whose leg, spear and head are occluded, but at the same time the occluded leg occludes the animals rear most leg. Another figure is throwing a spear which occludes the animal’s front two legs, but the figures lead arm is obscured by the animal’s head. Such complex occluding interactions could reflect an understanding of the complexities of our three-dimensional environment and how to depict them.

![Figure 4.104](image)

Finally, occlusion can also be found in abstract art, as well as figurative art. There are a number of examples of intersecting cup and ring marks from Argyll, Scotland, with one from Achnabreck being a particularly good example (Fig 4.32). Again it is evident that this is not the result of one being carved over the top of the other, as the carve of the occluded mark does not encroach upon the other. Meanwhile, Orthostat C16 from Cairn L at Carnbane West,
Ireland, shows cup and ring marks in close proximity with combinations of overworking, apparent occlusion and no interaction, suggesting the possibility that each was a deliberate act with different purposes (Fig. 4.33).

In addition, ornamental knot work is a form of abstract art for which occlusion is fundamental. It appears all over the world, in many different cultures. One could merge crossing lines in the pattern, but instead one line occludes the other, making the art more complex. This is evidentially a conscious choice and demonstrates a geographically and temporally wide spread understanding of occlusion.

A further example of a drawing convention which reflects environmental perception is diminishing size further up a group of depictions. Apparent size decreases with distance away from us, but at the same time (when upright) the ground moves further up our visual field as it becomes more distant. Groups of depictions in which those that are higher up are consistently smaller than those lower down, when of the same subject, could therefore be interpreted as depictions of a scene with depth. Figure 4.34 shows one such prehistoric example, the Shoemaker panel, in which the size of people and animals tends to diminish the closer they are to the top. It would seem unlikely that a lack of space is the cause of this, as the diminishing size is quite regular, and even after the larger figures had been carved there
would be plenty of room left for figures of a similar size. Equally no smaller figures are squeezed in around the larger figures. Only the boats have irregularity, though they still broadly follow this pattern, and boats can of course be of differing sizes anyway.

Another perspective based drawing convention is foreshortening, which allows the depiction of something as though it were three-dimensional. Baines (2007: 210, 231) argues that unforeshortened representation is nearly universal across cultures and the default method for untrained artists, it being easier to draw. Most Palaeolithic figures are in strict profile, and some show an animal’s horns/antlers as though viewed from in front (Halverson, 1992: 390), thus showing depictions which are not reflective of real world perception.
However, some art does depict things as though seen from a particular vantage. The earliest known example comes from the Chauvet Cave, in which the depiction of a bison shows foreshortening, and exploits a 90° bend in the wall to accentuate the effect (Fig. 4.35) (Willcox, 1984; Clottes, 1998). The double or thickened lines along the backs of some animals in the cave also suggest depth (Fig. 4.36). Basic examples of foreshortening can be seen in 5th century Greek vases, and a good example can be seen in the tomb complex of Phillip II of Macedon, from around 336BC (Fig. 4.37) (Willcox, 1984). Examples can also be seen in the rock art from the San region of South Africa (Fig. 4.38) (Lewis-Williams and Dowson, 1999: 120-121).

Figure 4.120- Foreshortening and use of wall shape (Chauvet et al., 1996).

Figure 4.116- Examples of thickened and doubled lines showing thickness/depth of an animal (Chauvet et al., 1996).

Figure 4.124- Scene from Phillip II of Macedon’s tomb complex, showing foreshortening, for example on the chariot wheels (Wikipedia, Public Domain).
The cave of Altamira is of particular note because it contains a number of different techniques which are indicative of visual perception and understanding of a fully three dimensional world. Figure 4.39 contains foreshortening on the boar, and as well as a number of instances of simple over working, an interesting case in the bottom right corner, where the front most animal is outlined in white where it overlaps with background paintings. This is of note because it makes the animal stand out more than simply over painting would have done. Given the arrangement of the panel it may not be an attempt to depict occlusion, but it would be worth looking for this technique in other rock art as it represents another deliberate choice in how to depict multiple animals. Altamira also contains many images of bison which have been placed upon, and shaped to, bulges in the ceiling, giving them a three-dimensional effect (Fig. 4.40).

These findings of widespread use of the same drawing conventions are supported by a review of rock art by Kennedy and Silver (1974: 321), who concluded that the depiction of things with line drawings was deeply rooted in the visual system. Out of 657 images reviewed from across the world, they found that 30% had occluding bounds (most of these being self-occlusion), that parallel features represented as single lines occurred in 66% of cases, and that features rare in contemporary art were also rare in the rock art (Kennedy and Silver, 1974).
Figure 4.132- Art from Altamira Cave with foreshortening and multiple methods of overworking (Thomas Quine, used under Creative Commons Licence CC-BY-SA-2.0)

Figure 4.136- Bison painted upon protrusions of Altamira cave ceiling (Matthias Kabel, used under Creative Commons Licence CC-BY-SA-3.0)
4.4.2 Gestalt Principles

The principles identified by Gestalt theorists point out certain tendencies of our visual perception system, when confronted with complex, incomplete or ambiguous information. Depictions in rock art that show Gestalt principles may suggest that these tendencies were shared by the people that created them, and their presence has been used by Hodgson (2000) in his discussion of the emergence of art.

The concept of figure closure or completion, where figures are perceived as whole when they are not, could be seen as a sub-type of gestaltqualitäten. A well-known modern example is the World Wildlife Fund logo and there are many examples to be found in prehistoric rock art. Disembodied animal heads and animals missing lower portions of its body are common in Palaeolithic art, and the perception of them as their complete subjects seems to be a perceptual act, rather than a matter of learnt convention (Halverson, 1992: 396, 400). Figures 4.25, 4.27, 4.35 and 4.43 are just a few examples, already selected for other reasons, which also demonstrate figure closure.

Prägnanz, the tendency to group separate things, is another Gestalt principle which can be perceived frequently in rock art, and we might therefore assume that it was perceived by the people who created that art. Arrangements of individual dots which can be seen as complete groups, rows or lines can be found across the world, with examples from Bolivia, off the coast of Brazil, France and Spain (Figs. 4.41, 4.42 and 4.43 are just some examples). Some of these dot arrangements are positioned such that, taken as a group, they form animal shapes (for example Fig. 4.42). The dot animals, as well as demonstrating prägnanz, could be seen as representing figure closure. Similar figures made of dashes can be seen in Zimbabwe (Bahn, 2010: 79).
The dot Bison, from Chauvet Cave (Fig. 4.42A) may be the earliest example of prägnanz, though the dot arrangement on a panel in the Cave of La Pasiega, Spain could be earlier (Fig. 4.43). This panel also has two examples of animal depictions which suggest figure completion. Uranium-thorium dating of carbonate formations over the dots give them a minimum age of 12,600 ±100 BP, however other elements in the same panel, made with the same colour pigment, have been dated to at least 64,800 years ago (Hoffman et al., 2018). It is evident from the U-Th dates that carbonate has formed over different parts of the panel at different times, and that it is not a continuous process; there were different dates from the outer most samples of different areas and there were sometimes large jumps in dates between different stratigraphic layers. It is therefore possible that all of the panel was created around the same time. A more comprehensive dating programme for the whole panel might demonstrate the sequence of carbonate formation, but the only way to prove the maximum age of different parts would be to take samples from below the paint. This panel is a particularly interesting
as the oldest samples show that elements were painted at least 20,000 years before *Homo Sapiens* arrived in Europe, indicating that the creators were Neanderthals (*ibid.*: 915). If other parts of this panel are of a similar age, this would have significant implications for our understanding of the development of visual perception across multiple human species.

![Image of rock art](image)

*Figure 4.144- Dot arrangements showing prägnanz to create animal forms. A- Bison from Chauvet Cave (Chauvet, 1996). B- Snakes from Huanuyoj, Bolivia (Bradshaw Foundation, 2011)*

The final Gestalt principle, figure/ground relations, could be seen in a range of abstract rock art, where the paint could just as easily be representing a pattern as a background. Paint acting as background rather than foreground is a recognised factor of rock art, for example in negative hand prints. At times, figures are represented by unpecked surfaces, and so the same might be said of carvings. One might ask, for example, whether the grooves or the ridges are the focus of cup and ring marks. Whilst for some the ridges look unworked, others appear to have been rounded off, smoothing the transition into the grooves. This serves to make these marks stand out more, and suggests that both elements, perhaps at different times, are important. Both the explicitly worked area and, the background left are then important, much
as in a figure/ground relation. Whilst these possibilities have been identified, this review found no depictions which could be identified as explicit figure/ground relations, such as Rubin’s Vase, however, a wider review of rock art may find relevant examples.

4.4.3 Illusions

Illusion is not a subject which has received much attention within archaeological literature, however Cochrane has raised interesting possibilities in his discussion of Irish passage tomb motifs (Cochrane, 2008; 2013). Certain patterns can overload contrast and orientation detectors, causing them to stimulate neighbouring neurons and create visual discomfort, illusions, headaches and dizziness; one such example is dense optical patterns (Cochrane, 2008: 166-167). Cochrane (2008; 2013) argues that some Irish passage tomb motifs resemble these patterns, and that when freshly cut and painted could have caused the same effects. One example is Fournocks I, County Meath, where Stones C, E and F have parallel zigzag lines (Cochrane, 2013: 355-358). Cochrane also argues that the effect may have been intensified in
the presence of flickering light, such as from torches (Cochrane, 2013: 356). Whilst these motifs may resemble dense optical patterns, Cochrane (2008; 2013) does not demonstrate that they are sufficiently like them to cause the same effects. It would be relatively straightforward to reproduce the patterns and test this assertion, and until this is done we cannot be certain that they are an example of a rock art illusory effect.

Another form of rock art which has been related to light, is cup and ring marks. Multiple authors have highlighted the difficulty of seeing them except under low light, during certain times of day (Waddington, 1998; Jones, 2012; Jones and Gosker, 2017). Whilst this will have been accentuated by erosion, it may well have been the case when originally carved, especially for the smaller examples. Jones (2012: 87) notes that most of the panels with rock art in Kilmartin, Scotland are oriented to catch early morning and evening sun, suggesting these times were important. In a wider discussion of cup and ring marks, Waddington (1998: 35) concurs, adding that they are often on nearly horizontal surfaces to accentuate the effect. Jones and Gosker (2017) further add that such carvings are visible under certain directions of moonlight and that the act of carving may have been as significant as the resulting image. This interplay of rock morphology and light raises interesting questions about the role of illusion in cup and ring marks. Figure 4.44 shows a well-recognised illusion which relies upon our brain assuming that light comes from above (Harris, 2014: 49). This same effect can be seen when images of cup and ring marks are rotated (Fig. 4.45).

Figure 4.156- An illusion showing the brain’s assumption that light comes from above. The left circle appears to be concave and the right convex. The right circle is the same except rotated 180 degrees.
Figure 4.161 - The upper panel at Cairnbaan (Jones, 2012: 86). A- As originally presented. B- Image rotated 180 degrees. Due to the direction of the light there is some ambiguity, both A and B can appear to have convex or concave cup and ring carvings.

C- Image rotated 90 degrees. D- Image rotated 270 degrees. The direction of light causes less ambiguity; Image C appears to have convex cups and rings, D appears to have concaved cups and rings.
A search of other images of cup and ring marks with strong directional light shows that this is a trend in such carvings, and can be particularly striking when the carvings are wet (Fig. 4.46). The illusion is dependent upon the direction of the light however, and so isn’t visible in all cup and ring marks. These examples are photographs, which are monocular views; it may be that in order to be experienced in the real world, like the Ames Room and trapezoidal window illusions, the viewer would have to close one eye. However, some depth illusions, such as the hollow mask illusion, persist even with binocular vision (Hill and Johnston, 2007: 202). It would be worthwhile exploring this illusion with a reproduction cup and ring carving to learn more about its effects.

Figure 4.169- Beamley Moor 1, Northumberland. A appears concave and B appears convex. These are best viewed separately as the lighting cues for A can override those in B if viewed together. This suggests that the cues are stronger for the real perception and are made more explicit through being wet. (ERA: England’s Rock Art)

The effect of this illusion is most striking when it is possible to see the different views sequentially, rather than relying upon knowledge that a surface in convex though it appears not to be. However, it is not possible to rotate a rock art panel, or, necessarily, to position
oneself to get the best view of this illusion. It is also the case that in real world visual perception the power of the ‘light from above’ assumption is lessened by light direction cues from the wider environment (Morgenstern et al., 2011; Proulx, 2014). If viewed at night, however, as Jones and Gosker (2017) suggested, it would have been possible for past people to manipulate the direction of the light using fires or torches, removing these obstacles. Combined with this illusion, the flickering light may have made the rock surface appear to move. In order to explore this without visiting sites at night, a number of Reflectance Transformation Imaging files have been used, allowing for the movement of a light source in an image of rock carvings.

As it was out of the scope of this thesis to collect RTI data, there has only been the opportunity to analyse a small number of RTI files collected by others. Once again, a more focussed study may offer further insights. Blairbury 6 in Dumfries and Galloway, has heavily eroded cup and ring carvings which show the effect of moving light, even on a heavily eroded carving (Fig. 4.47). A carving from Boyarch Farm, Dumfries and Galloway showed no change in depth cues, but the bottom corner does seem to change shape as the light moves, whilst the rest of the rock remains stable. This is difficult to capture on paper but can be seen by scrolling through the images in Appendix 13 on the accompanying CD. One other, heavily eroded, cup and ring mark analysed showed no effects from a moving light. Due to the limited number of examples of cup and ring marks available, other RTI files with carved shapes were also analysed. A gravestone from the Old Church of St. Nicholas, Uphill, which has roundels upon it, much like cup and ring marks, shows the reversing of depth effect (Fig. 4.48), whilst a carving on the wall of the church shows that the effect can work on other shapes as well (Fig. 4.49)
Figure 4.178- Blairbury 6 cup and ring carving. A shows the carving lit from the top left. B shows the carving lit from the bottom right and the apparent depth has been reversed. The diagonal cut now appears to be a ridge and the cup a mound, whilst the uncarved area of the ring appears to be an indent. (RTI file courtesy of Joana Valdez-Tullett)

Figure 4.183- Roundels on a gravestone from the Old Church of St. Nicholas, Uphill. A shows the light from the top, with the roundels appearing their correct shape. B shows the light from below, with the ridges appearing to be indents. The lichen obscures the effect somewhat. It is most visible on the left roundel. The centre of each roundel is so deep that it always appears to be indented. (RTI file courtesy of Wessex Archaeology)
These examples demonstrate the effect, and various ways in which it can be produced. This is not confirmation that past people viewed carvings in this way, but it does raise a possible new avenue of investigation. If Jones (2012) is correct, and rock carvings such as those at Kilmartin were positioned to be viewed primarily at sunrise and sunset, then environmental light cues (Morgenstern et al., 2011; Proulx, 2014) would negate this illusion, however, we need not see this as an either/or situation. Having been difficult to see throughout the day, the sunset may make the carvings appear to viewers, and they could then be manipulated using torch light during the night. This could be seen as the rock surface coming to life and

Figure 4.184- Carving on the wall of the Old Church of St. Nicholas, Uphill. A shows the light from the top, B shows the light from below. In B the triangles, the circle around them and a number of other minor features appears as though they are convex rather than concave
(RTI files courtesy of Wessex Archaeology)
moving. The rising sun would then see the carvings set in a new shape and slowly disappear once more. If these carvings were created during the day, their sudden appearance could have an even greater impact. In order to further research this possible scenario it would be worthwhile collecting RTI data sets of as many cup and ring, and indeed other rock carvings, as possible, to identify panels which could be used to test this possibility in person.

This section has highlighted two possible types of illusion in prehistoric rock carvings, the perspective illusion present in the Nasca geoglyphs discussed above is another. There are a wide variety of illusions, and so it may be that a dedicated search for them within rock art, as with drawing conventions, may find more instances. Some illusions, being based upon ‘carpentered views’, such as the Müller-Lyer illusion, are probably unlikely to be found in the oldest examples though. If illusions were created by past people then it is likely that they perceived them, rather than it being a coincidence. The more examples which can be found, the higher the likelihood that this is the case. If past people perceived the same illusions as modern people, then this is another factor suggestive of the similarities in visual perception.

4.5 Archaeologies of Colour

MacGregor (2002) has discussed the importance of understanding past peoples’ perception of colour, and Jones and MacGregor (2002: 2) have asked whether colour perception is universal across space and time, and if not to what extent does it vary within a given context. Chapter 2 discussed experiments on the perception of colour, which suggested that colour perception is broadly the same across cultures, with language allowing finer discrimination of different hues (Bornstein et al., 1976; Bornstein, 1990; Franklin and Davies, 2004; Wolfe et al., 2015). However, there was some suggestion that early experience can change one’s ability to discriminate colours (Bornstein, 2007; Franklin and Davies, 2006). As with other elements of perception, it is worthwhile exploring the extent to which this might apply to past cultures. Gage (1999: 112) has argued that past people “clearly perceive” colour distinctions in the same way, even if they did not label them, but how can we be certain? Even if different colours are used, it does not necessarily mean that their colour was perceived differently. Past people used the materials available to them, and these may look different to us but may not have done to them.
It is common to make use of the work of Berlin and Kay (1969) to suggest that people in different cultures perceive colour in similar ways, whilst the meaning of that colour is culturally constituted, or that there is a development of colour perception/use tied directly to linguistics/cultural complexity (Jones, 1999; Jones and MacGregor, 2002: 8; Chapman, 2002). Saunders and von Brakel (1997: 168) have critiqued Berlin and Kay’s (1969) research, and argue that such work only continues to be used because people “over charitably assume that the parts in which they are not experts are sound”. This is not a universal view (see for example Jameson, 1997), but there are multiple exceptions to their scheme (Simpson, 1997) and we must be aware that there is a difference between perception and the language used to describe it. Baines (2007: 245) believes that the assumption that colour use and terminology should coincide has blocked progress in colour research.

Noud et al. (1997) assert that there is a contrast between perceptual categorization and colour naming research, the former showing that there are universal features, the latter that there are not. These are investigated differently, and the need to communicate puts constraints upon colour naming which will vary with cultural differences (ibid.). Further to this, Bornstein (2006; 2007), and Franklin and Davies (2006) assert universality in perception in infants, which is modified by experience. There is therefore a real possibility that past people perceived colour differently.

Given that colour perception may vary according to culture, but that language does not necessarily directly reflect perception (Noud et al., 1997), any investigation into past colour perception should focus on material manifestations of colour over linguistics, though the latter may still offer insight. There must be clear structured differentiation in the use of colours to suggest that past people perceived differences between them. Even then we must be careful; a material may have different properties, either material or cultural, beyond its colour, which make it appropriate for different uses. To be certain, we must therefore find structured use of colour which transcends simply use of different materials, unless they are otherwise broadly the same.

Looking at the use of pigments within Egyptian art and the terminology used to describe the colours of those pigments, Baines (2007) argues that there is a clear distinction in the use of different colours, suggesting that they are perceived differently but that colour naming lags
behind. Whilst there is a sequence of development in the use of colours, Baines (2007: 254) believes this to be stylistic rather than perceptual development. Spence (1999) highlights the structured use of black and red stone for particular purposes within architecture, the latter sometimes being replaced with materials painted red. The distinct uses of different coloured pigments shows (Baines, 2007) that at the very least, in the Old Kingdom, Egyptians perceived the colours white, black, red, yellow, green and blue differently, and in the New Kingdom brown and pink as well.

In contrast, Myrberg (2010) argues that in medieval Europe colour was perceived differently; texture, wetness/dryness and brilliance were as much a factor as hue. Cross hatching on coins represented red, in heraldry colour could represent texture, animals or celestial bodies, and the colour on a shield would be regarded as what was stated, not the actual shade used (ibid.). However, arguably all of these things are higher order cognitive functions based on cultural associations of colours, rather than actual perception. This is not to deny the possibility that this was a variation in visual perception, but Myrberg does not make a compelling enough case. Unfortunately the distinction between perception and cognition cannot easily be tested without access to someone from this culture. One cannot deny the importance of cultural conceptions of colour, but this is not the evidence which this thesis is looking for.

Evidence for structured use colour which has received a lot of attention, is the use of different stones within monuments. Ten of the 23 recumbent stone circles analysed by Lynch (1998: 65) have recumbent stones of different colours from the rest of the circle. Some have even more structure; at Castle Fraser the recumbent stone and its flankers are grey, whilst the eastern part of the circle alternates grey and red. At Easter Aquorthies the recumbent is a darker grey than the adjacent stones and stones alternate grey and black on the west side, and, between shades of pink on the east (Lynch, 1998: 66; MacGregor, 2002). There is a lot of variation in these colours though (MacGregor, 2002 146-148); it may be that it is the material rather than the colour which has been selected. At Jardin aux Moines, Brittany, the kerb stones alternate between red schist and white quartz (Lynch, 1998: 64) and Jones (1999) discusses a number of examples from Ireland where the use of quartz, granodiorite, siltstone and sandstone show patterns. For all of these examples it could be properties other than
colour which were identified, as the variation at each monument is from differently structured rocks.

Perhaps the most widely discussed monuments for their structured use of colour are the Clava Cairns, Inverness-shire. Towards the rear of the cairns there tends to be more pieces of quartz whilst the front is predominantly red, and the kerbs change colour along their course (Lynch, 1998; Bradley, 2000; Trevarthen, 2000). Black stone meanwhile is only found at the back of the chambers in the chambered tombs (Trevarthen, 2000). These changes have been linked to the midsummer sunrise and midwinter sunset (Lynch, 1998; Bradley, 2000; Trevarthen, 2000; Jones and MacGregor, 2002). Trevarthen (2000) goes further and associates particular coloured sections of kerb stones with key summer and winter sunrises and sunsets. However, his claims to do not hold up to scrutiny; some sections are not the colour they should be for his scheme, some sections have no clear structure at all, key lines may fall either within or at the boundary of a section, some stones are ignored, some boundaries extend well beyond where they should end, and pink stones are variously described as red or white depending upon the needs of the argument. Whilst there is some evidence of structure, as with other sites, the different stones at Clava Cairns are of a completely different type and so it is not necessarily colour which was selected for in this structure.

Colour has also been looked at in relation to stone axeheads, with Cooney (2002) suggesting that colour may have been a way of distinguishing axes from different sources, and that their appearance may have been more important than their functionality. Axeheads of different colours/sources were also shaped differently (ibid.). Again the extent to which these factors were purely due to colour is difficult to say without direct comparison of comparable materials.

4.6 Implications for Cross-Cultural Perception

This chapter has looked at archaeological evidence which might give insight into the process of visual perception in past people, as such it is more relevant for archaeological interpretation than presentation, though the former leads into the latter. It has also looked at perception in general, rather than focussing on landscape, although some elements have
been directly relevant. This has necessarily been done through analogy to modern understanding and perceptual research, and so there is always the possibility that there is a cultural bias present in the analysis. Without access to past people, this cannot be overcome. However, there does seem to be a broad array of evidence which is directly relatable to our modern, western understanding of visual perception.

The discussion of maps has shown that they have a long history stretching back, potentially as far as the Copper Age. Depictions of wider spatial relations, in the form of picture maps, may have an even longer history, stretching back to the Palaeolithic. Whilst the earliest examples may not be maps as we understand them, the intent to depict spatial relations demonstrates that past people had a clear understanding of them.

The examples from more recent pre-literate societies, discussed in the second half of Section 4.2, demonstrate a shared understanding of spatial relationships and how to depict them across different cultures. Both maps and geoglyphs require understanding of how the environment might be perceived as though from above. This could be seen as an application of sensorimotor knowledge; it is an understanding of how what one can see relates to how it would be seen from a particular vantage. In this case, it happens to be a vantage which was not possible. The archaeological evidence for both of these suggests that even in the Palaeolithic, people were able to conceive of the world as if from above. This gives weight to the interpretation of the earliest archaeological examples of maps, and suggests that people from across different cultures perceive spatial relations in a similar way. On a smaller scale we can also see the depiction of spatial relations through the drawing conventions identified in rock art from across different periods and regions.

The examination of Gestalt principles and drawing conventions has also revealed evidence to suggest that certain perceptual processes and characteristics may have been shared by past people and potentially even Neanderthals. Evidence of perceptual illusions was quite sparse, but the real world converging line illusion present in a number of Nasca geoglyphs may indicate that the creators perceived real world depth through at least one similar mechanism. The two potential rock art illusions of dense optical patterns and changing depth cues require further investigation, and even if they do occur in a real world setting there is no guarantee that they were recognised or used by their creators. However, if they were, it
would demonstrate another aspect of modern visual perception present in a particular group of past people.

The evidence for similarity in the perception of colour is scarcer. Without access to past people it is difficult to distinguish between higher order cognitive concepts and visual perception. The evidence for structured prehistoric use of colour cannot be distinguished from structured use of particular types of material, and so we cannot be confident that the colours were perceived differently. In order to do this we would require structured use of, for example, different sedimentary rocks of varying colour, such as sandstone. The evidence for ancient Egyptians however is quite convincing; they seem to have perceived at least some colours in a similar way to modern people.

Whilst individual examples can only be directly applied to the context in which they have been found, many of the perceptual characteristics hinted at in the evidence reviewed in this chapter can be found in multiple different time periods and locations. Art from Chauvet Cave, amongst the oldest figurative art in Europe, the Har Karkom geoglyphs and potentially art from La Pasiega, are particularly interesting due to their age. The evidence suggests that the perceptual characteristics discussed here may be cross-cultural, and perhaps even apply across species boundaries. This shouldn’t necessarily come as a surprise, given the findings of some of the animal experiments into visual perception discussed in Chapter 3.

This chapter has served to give indications about past perceptual experience, and offer further evidence for a number of perceptual traits. Whilst making use of a range of different mediums and scales, much of the evidence discussed is very much based in two-dimensional representations. This has necessarily been the case, given the requirements of such an investigation, but it does leave these conclusions open to the same problems and caveats discussed in relation to much of the existing cross-cultural research. The extent of commonality apparently on display is interesting however. In discussion of Palaeolithic art, Halverson (1992: 401) has argued that there is no reason to regard the perception of pictures as culturally specific, and the San art discussed here, which demonstrates understanding of pictorial depth, comes from the region next to the home of the Bantu that Hudson studied. This chapter has therefore served to reinforce the conclusions drawn from the review of perceptual research, and extend their findings back into the past. Nonetheless, the major
issue of ecological validity remains, and there is an additional problem of dealing with silent subjects. Rather than investigating how past people perceived, this thesis has interpreted the material culture they have created; undoubtedly introducing bias. There therefore remains the need for an ecologically valid, cross-cultural experiment into visual perception.
5 Applying Perceptual Research to Archaeology

The experimental and theoretical evidence from Chapters 2 and 3 were synthesised into an Ecological Motor Theory which suggests that visual perception is not significantly affected by cross-cultural variation, whilst Chapter 4 suggested that certain characteristics of visual perception were shared with various peoples in the past. Though the issue is far from settled, it is therefore possible that past and present people visually perceive the landscape in a similar way. If this is the case, then archaeologists’ attempts at interpreting landscapes through visuo-spatial approaches have a valid basis. However, issues with this assertion still remain. The archaeological evidence and perceptual theories discussed have been interpreted/developed by modern western individuals, and further experiments are needed to confirm some of the arguments discussed in Chapters 2 and 3. Further to this, the experiments have not taken place in a landscape, or even a truly ecological setting. Given this, we cannot even be confident about the correspondence of visual perception in modern people of different cultures, and so there are also still serious questions about site presentation.

To unquestioningly take ideas formulated in relation to modern western people in abstract experiments and apply them to the perception of landscapes in people from other cultures, would be inappropriate. Until we can be confident about the visual perception of the landscape and have adequately explored cross-cultural variation, this issue cannot be entirely resolved. In order to achieve this, an experiment which specifically aims to understand how culture affects visual perception of the landscape is required. Such an experiment will fulfil the fifth aim of this thesis, “determine what aspects of visuo-spatial perception, in a landscape context, may be affected by culture, and to what extent, through a perceptual experiment at Stonehenge”. Whilst this experiment can be directly applied to the problem of data validity in landscape archaeology for site presentation, its use for interpretation requires theoretical underpinning.

5.1 Perceptual Uniformitarianism

One of the fundamental aspects of an archaeologist’s work is the temporal gap between themselves and the people they study. As discussed later, this gap reduces the available evidence, clouds interpretation and makes archaeology distinct from ethnography. Much of
archaeology is working out how to overcome this gap, linking what we discover in the present to the past. This gap means that we cannot directly compare archaeologists’ perception with the people they study, but Perceptual Uniformitarianism is one method for overcoming this.

The fundamental assumption of all archaeological study is uniformitarianism, the idea that, under the same conditions, processes occur the same way irrespective of time or place. Without uniformitarianism we could never make any statements about the archaeological record as it relates to the actual past; we would not be able to understand how the archaeological record formed. Experimental archaeology in particular makes use of uniformitarianism, whether implicitly or explicitly, to justify its practice and the utility of its findings, such as in relation to taphonomic processes (Andrews, 1995).

Perceptual Uniformitarianism applies this concept to perception; variations and constants of perceptual processes will hold across time and place. Culture affecting perception can be seen as such a process, and therefore, if it can be shown that culture does not affect how one perceives the landscape in a modern context, then culture should not have had an effect in the past. It is important to stress that perception is not the process in question here, but perceptual variation caused by cultural influences. It is also worth reiterating that perception is the basic act of picking up information about the world, prior to higher order conceptions of it; it is not the totality of lived experience.

One could also argue for biological differences in perception, however, DNA studies have shown that people today are genetically much the same as those 40,000 years ago (Renfrew, 2005). When looking at non-human species this becomes more complex of course, but one could use Clark’s (1989) *gradualistic holism* to argue that even for relatively temporally distant hominid species there is reason to suppose similarities in visual perception, should culture be shown not to have a significant effect. Clark (1989) argued that since evolutionary changes must be functional for their current context, whilst emerging from existing structures, biological systems have increasing constraints upon them as time passes. One could therefore say that there is an evolutionary weight to complex biological systems which it is difficult for new adaptations to overcome. This certainly seems to be the case with the visual system, with the Pax 6 gene involved in the development of all major eye types (Gehring, 2014: 27), the vertebrate eye having developed by 500 MYA (Lamb et al., 2008: 418-419) and a common
basic layout to the nervous system in all bilaterally symmetrical animals (Butler, 2012). This argument seems to be accepted, at least to a degree, within perceptual research through their use of animal models (Riesen and Aarons, 1959; Held and Hein, 1963; Walk, 1979; Walk, 1981). The potential Neanderthal art from the Cave of La Pasiega could also lend credence to this idea (Hoffman et al., 2018). There are of course differences in physiology which mean that one cannot argue for exactly the same perceptual process however, and Fujita et al. (2012) have shown that the visual system of different species’, although having similarities, are adapted to their specific environmental niche.

Within a single species one could use the idea of evolutionary weight to argue against the effect of culture upon visual perception. Why should we expect culture to overcome the constraints Clark (1989) described, when environmental pressures and genetic mutations have, to a large degree, not? More recent work has shown this issue to be more complicated than perception being affected by culture or biology independently (Bornstein, 2006; 2007). Culture may be a new adaptation to local problems; the meme rather than the gene serves as a solution to new pressures (Mesoudi et al., 2004; Tyler, 2011). Not only is memetic adaptation faster, but it also alters the environment in which genes evolve (Henrich et al., 2008; Downes, 2009; Tyler, 2011 Gil-White, 2014). This rapid development may then be able to do things which genetic mutations cannot alone. Gene-culture interactions have been demonstrated to have an effect on the genome of different groups (Laland et al., 2010), and Henrich et al. (2008: 133) believe it likely that memes have shaped our cognition; perhaps it is through such a mechanism that culture may affect visual perception.

However, like biology, memes/cultures have a weight to them. A meme’s success depends upon its environment (Gil-White, 2014) and there are many instances where environmental conditions change whilst culture does not (Mesoudi et al., 2004). Atran (2001: 375) and Gil-White (2014: 337) argue that memes which are compatible with parts of the mind evolved to respond to the environment, will be the most successful and then remain stable across cultural changes. Cultural evolution may then cause rapid changes, or enshrine certain characteristics and prevent change in response to the environment. Whilst disadvantageous memes can spread (ibid.), it is probably unlikely that they would be ones that change physiology, due to natural selection. If this is the case, then cultural adaptation may have
changed how different groups have perceived in the past and the adaptation would likely last, unless a situation emerged in which it was advantageous for it to change, or cultural pressures/mergers saw it replaced. One would therefore expect cultural differences in perception, if they ever existed, to still be present within modern cultures. Ultimately, these arguments are a priori in the case of cross-cultural visual perception, and experimentation is required to resolve the issue.

Uniformitarianism is also an a priori concept, since we cannot experience all times and places, however, as one of the fundamental assumptions of science and the root of the principle of repeatability, it developed in response to extensive experience which showed it to be true. Nonetheless, its use in the context of this research is not uncontroversial. Objections to its use to justify that the effect of culture upon visual perception is the same, irrespective of time, would require a strong case to be made as to why uniformitarianism should not apply in this case. This would likely necessitate denying its use generally, leaving archaeology a discipline which has nothing to say about the past, only the present. Whilst for some post-processual archaeologists who adopt relativist positions (Shanks and Tilley, 1992; Thomas, 2001; Eve, 2014; Springs, 2015) this may not be problematic, most archaeologists would argue that they are trying to research a real past (Bintliff and Pearce, 2011; Nicholas and Markey, 2015).

Even if we accept Perceptual Uniformitarianism it would be possible to argue that our interpretations are invalidated anyway. If the perceptual process is the same today as in the past, and we are perceiving an altered landscape, then the resulting interpretation will be different. In all archaeological investigations this is the case, though the impact varies due to the extent of landscape change (Aston, 2001; Bell, 1982; 1983; French, 2003; Kytamannow, 2008; Rippon, 2004; Waddington, 1999). In other words, the process may be the same, but if the input is different, the output will be different as well. Indeed this idea is implicit in the discussion of an extended approach to perception. This brings into question whether we can understand the relationship between our visual perception and that of past people. The problem here ceases to be access to past people, but access to past landscapes.

This is evidently an issue for this thesis; it seeks to build a valid foundation for hypotheses of landscape archaeology, but if interpretations are undermined by the available evidence,
this has not been achieved. This is in fact a problem for all archaeology. The input is always different, no matter what is being studied; we never find something in perfect condition, in a complete original context of use. Arguably, there is no such thing as an original context, as all things have a lifecycle of their own (Lucas, 2012: 103). This is ultimately about the representativeness of the archaeological record, something which, in various guises, has been a key concern of archaeology since its inception (Lucas, 2012). It is an unfortunate fact of archaeology that we do not deal with the past itself, but with its remains. Although, strictly speaking, we do not even have this, as although it was created in the past, all archaeological data is a contemporary phenomenon; it has been continually acted upon and continues to be acted upon.

Michael Collins (1975) has pointed out seven sources of bias in the archaeological record:

1. Not all behaviour results in patterned material culture
2. Of those that do, not all can enter the archaeological record
3. Of those that can, not all will enter the archaeological record
4. Of those that do, not all will be preserved
5. Of those that are preserved, not all survive indefinitely
6. Of those that survive, not all will be uncovered by the archaeologist
7. Of those that are, not all will be recognised or identified by the archaeologist

Archaeologists are never in direct contact with the past, only contemporary remnants of it. Our evidence is biased by the processes which led to its creation. We can therefore never gain understanding of the past directly; the data cannot speak for itself, but must be interpreted (Binford, 1968: 13).

We must use theory and ever more investigation to form and test models about how present data relates to the past. We must always work around the problems inherent in the archaeological record, but if we reject the notion that limited cultural effects upon perception found in a modern context apply universally, we will be further hampered by lacking the basic foundation of knowing that we perceive attributes, relationships and basic affordances in the same way as the people we are studying. We will therefore have data, and interpretations of that data, which relate to the past in an unknown way.
To represent this another way, we might view these connected problems of perception and record as an equation. Currently in archaeological thought we have the following:

\[
\begin{align*}
\text{Past} & \quad \frac{X \times (Y \times a)}{(X \times b) \times Y} = Z \\
\text{Present} & \quad \frac{X \times Y}{(X \times b) \times Y}
\end{align*}
\]

Here \(X\) represents material culture, \(b\) is the transformation this has undergone to reach its current state as the archaeological record (in this case the changes in the landscape), \(Y\) is the modern perceptual process, and \(a\) is the differences between modern and past perceptions. \(Z\) is the data from which we can build our hypotheses. \(a\) and \(b\) are thus currently unknowns and so we cannot be confident about what data we should be using as landscape archaeologists. Material culture and the perceptual process undergo a transformation from one thing to another, it is not as simple as an addition or subtraction. It is not that a modern person sees the hill and past one does not, it is that both see it, but they may see it in a different way, their perception has been transformed by a different process.

If the fieldwork experiment shows a limited cultural effect on visual perception, and we apply Perceptual Uniformitarianism we will instead have the following:

\[
\begin{align*}
\text{Past} & \quad \frac{X \times Y}{(X \times b) \times Y} = Z \\
\text{Present} & \quad \frac{X \times Y}{(X \times b) \times Y}
\end{align*}
\]

Here the potential difference in perception, \(a\), has been removed, and \(Y\) has been more fully defined. The result is one unknown, \(b\), which is increasingly definable with archaeological investigation. If \(b\) were fully quantified we would know \(Z\). Although this can never be done, it will continue to be narrowed down, in turn narrowing down \(Z\).

Whilst Wylie (1989) has argued that weaving together independent lines of evidence can reduce the number of possible archaeological narratives, with the two unknowns currently affecting archaeological research no amount of additional data, refinement of technique, or use of theory, will allow this. Renfrew (2005: 30-31) has stated that, for many archaeologists,
there is the need to develop a secure methodology with which we can learn how the minds of past peoples worked. By addressing the issue of visual perception of landscapes, this current work aims to take the first steps towards this and to bring landscape archaeology to a point where it can work from these three known quantities. This will result in archaeological interpretations with a greater foundation of validity, brought on either by knowledge that we can be correct, or a more honest understanding of our limitations.

5.2 The Rationale for a Perceptual Experiment

Making use of Perceptual Uniformitarianism, an experiment looking at the effects of cultural background on the visual perception of landscapes in a modern context would allow us to understand the potential size of the perceptual gap between archaeologists and the people they study. If there are very few differences to be found in modern people of different cultures, then we can be confident in our data collection, so long as we bear in mind the warning offered by Michotte’s (1991: 65) work regarding attention. We can also be confident that there are no underlying perceptual problems in formulating site presentation. If, however, there is found to be fundamental differences in people’s perception of the landscape, then it is likely that the perceptual gap between archaeologists and past people is at least as large as the two most differing groups. Once the potential of this gap has been quantified, we will have some conception of how accurate it is possible for our archaeological hypotheses to be and an understanding of what we can and cannot confidently discuss. If the potential gap is small, it does not mean that they are correct, but it means that we can make the correct ones, contrary to the likes of Kytmannow (2008), and Smith and Blundell (2004).

Whilst all theories are constantly open to disproval by new evidence, they will have passed a major test; the possibility that they could be correct. Fundamental differences in perception would also increase concerns discussed in Chapter 1 about how we currently present sites to a diverse audience. Whatever the result however, the data from the experiment may help heritage site managers present their sites in ways which are more meaningful and more engaging to that audience.

Whilst this thesis looks to determine the extent of this bias in data collection, Hodder (2000a) has started from an assumption that a problem exists with his work at Çatalhöyük. In order to overcome the problem of data validity caused by this potential bias he has used a
reflexive methodology that incorporates the views of all interested parties (*ibid.*). However, practices such as sharing only the evidence which is of interest to groups that have predetermined ideas and agendas (see Bartu, 2000: 104) only serves to further bias any interpretation. Even archaeologists fall victim to the impulse to make all evidence fit a theory at times (see Fleming, 1999; 2005; 2006), and so it is important that all participants are well informed if the incorporation of others’ views is to be productive. Whilst attempting to foster goodwill amongst all parties, and to recognise popular conceptions of Çatalhöyük despite “their lack of scientific underpinnings” (Hamilton, 2000: 121), Hodder’s team have created problems for the development of hypotheses about the site, all whilst using data which has been selected by archaeologists for recording, and thus not surmounting the interpretive problem of data collection.

It must be stressed that just because we may perceive the landscape in the same way, it does not mean that our interpretations are necessarily correct. We cannot *know* what past people were thinking about what they perceived, this higher order cognition is lost to us. However, Scarre (1994) has demonstrated that we can make accurate interpretations nonetheless. He argues that without textual evidence it is still possible to chart how Egyptian governance changed from being dispersed and secular, to a strong, centralised, non-secular power which used abstract symbology (Scarre, 1994: 77). He goes on to argue that since much of our information about these tombs comes from texts hidden inside, the majority of people living at the time of their construction would not have understood their full meaning (*ibid.*). Of course in this example, Scarre had the advantage of prior knowledge to guide which interpretation to follow and look for evidence of, but it still shows that correct interpretations are possible without cognitive insight. Although we will surely miss the details, there is still promise of uncovering a great deal of accurate information about the past, and the possibility of making correct interpretations.

The first requirement for the proposed perceptual experiment is that it must have participants from a broad range of cultural backgrounds. It was argued in Chapters 2 and 3 that the abstract experiments used in other research do not fully reflect actual lived experience, and Rochat (2010) has argued that ecologically valid experiments are required to avoid cultural specificity in the test procedures. An experiment into the visual perception of
the landscape must therefore take place in a real landscape. This experiment would therefore constitute perhaps one of the first real world comparisons of the effect of culture on visual perception.

The experiment will focus on visuo-spatial aspects of the landscape; focusing on a single context of perception avoids the uncertainty inherent in dealing with such a broad area as perception. There may always be exceptions and peculiarities created by certain situations, as has been clearly demonstrated in Chapters 2 and 3. Other characteristics than culture will also be assessed to determine the extent to which they are influencing factors. In particular, archaeological knowledge will be considered as an important concern, as archaeological training is in itself a self-reinforcing bias; archaeologists are taught by, and have read the work of previous generations of archaeologists. Therefore, whilst the focus of this thesis is culture, the experiment will also look at other factors to determine the extent to which each has an effect on visual perception.

An alternative to using a real landscape for the experiment would be to use virtual reality. This would offer greater flexibility, and allow the experiment to be tailored more closely to information of use in determining different groups’ perception of visuo-spatial relationships. In the context of investigating specific landscapes it would also allow the presentation of a particular time period, removing later features. Whilst virtual reconstruction removes some of the complications facing archaeologists in landscapes with long developmental sequences, it comes with its own problems which render it unsuitable. Firstly, there is the practicality of implementing such a methodology; the each landscape studied would require a virtual reconstruction, and presenting them to a large number of participants would be costly and time consuming.

There are also a number of problems in creating such a representation, for example, in order to create a reconstruction, a large amount of data is necessary, and this can never be exhaustive. Thus the representation will not be an exact recreation of the past landscape, and yet the very act of representation may invoke confidence in the participants, making them believe it is accurate (James, 1997: 26). In addition, the very act of representation involves the selection of evidence and the limitations of the chosen medium, thus we are already presenting an interpreted landscape to the participants, even if doing so unconsciously. Any
reconstruction will thus be a curated experience, influenced and constrained by the creator’s ideas and perception; again interpretation will be biased towards archaeological norms. Creating a fictional landscape meanwhile overcomes issue of data acquisition, but further reinforces the bias.

Lastly, there are issues of the participant’s engagement; virtual reconstructions cannot offer physical engagement and are necessarily non-ecological. This lack of ecological validity invalidates the process, since bodily engagement is vital for a valid assessment of real world perception (Gibson, 1986). In addition it has been demonstrated by Kroh and Gimblett (1992) that representations of landscapes offer different experiences than the landscapes themselves.

An alternative would be the use of augmented reality or the kind of sensory GIS proposed by Eve (2014), thus creating a more embodied experience of the past. However, Eve (2014) has stated that such an approach does not allow us to experience landscapes as they were in the past; instead it facilitates the phenomenological approach of modern investigators analysing their own experience. The problems of phenomenology still stand, and such augmented approaches face the same issues of evidence selection as virtual reality. Despite some of the limitations, a real landscape therefore seems to be the best option for a perceptual experiment.

Should this experiment prove to be successful, the combination of ecological validity and wide scale participation could serve to create a new methodology for landscape archaeology, a crowd-sourcing of interpretation. Such a methodology would not only be of use in generating new interpretations but also in testing those which have already been made. By placing the act of interpretation into the hands of the masses, as opposed to the act of hypothesis formation as Hodder (2000b) has done at Çatalhöyük, we can attempt to minimise the interpretive bias in data acquisition and avoid the pitfalls evident in his work.

5.3 Possible Outcomes of this Application of Perceptual Research

The use of perceptual theory has not received enough attention in archaeology. By highlighting the importance of perceptual issues this work hopes to foster more research into how these topics are linked, especially in terms of archaeological epistemology. Perceptual
research could highlight aspects of the material record which can and cannot be talked about with confidence, and it may offer possibilities for how archaeologists might become more confident in talking about the more difficult aspects of the record. It may also open up completely new avenues of research, some of which have been briefly explored in Chapter 4, and offer insight for current studies.

Whether the results of the experiment demonstrate a cultural effect on perception or not, the extent and nature of one of the potential sources of bias in data collection will be better understood. Another possible outcome, as discussed above, is the development of a crowdsourced interpretation methodology. Whilst this in itself will not lead to a greater understanding of the past, it does offer the chance for a range of insights. Firstly, it can be used as a tool to better understand the public visiting a site and how they respond to/interact with it. Should the perceptual experiment find that culture does not have a significant effect on how one perceives the landscape, this methodology could be used to identify different aspects of the landscape which can be attended to. It could also be used to test previous hypotheses, as even if visual perception is not culturally determined, an individual’s interpretation is not necessarily valid.

Should the perceptual experiment find that culture has a significant effect on perception, the crowdsourced interpretation becomes even more useful. If we cannot be confident in archaeologists’ interpretations, we must take one of two paths. The first is to follow Shanks and Tilley (1992) and accept that archaeological research says more about the present than any actual past. The second would be to work with possibilities, to accept that we can never accurately interpret the past but that we can try and narrow down the possible pasts. Some might argue that this is what archaeologists do, but a review of archaeological literature will show far more works presenting a single hypothesis as fact, rather than a spectrum of possibilities and the evidence required to disprove each. Wylie and Chapman (2015: 15) noted that multiple contributors to their volume advocate keeping multiple hypotheses open; the fact that this was worthy of note demonstrates that it is not the norm within archaeological research.

With the two unknowns, perception and the archaeological record, possible pasts will never be clearly defined, but the crowdsourced methodology could be used to identify as many of
the possible interpretations as possible. As discussed above, it is better to state something about the landscape to which past people did not attend than to miss all the things which they did attend to; the former offering a better chance at future refinement, and showing a full representation of the state of archaeological knowledge. Rather than presenting a single past as true, an archaeologist will have to create a multiplicity of pasts, all of which could hold the potential for truth. This would also offer greater potential for engagement from a diverse public. Ultimately, archaeology would be in no worse a position than it is currently; the relationship between past and present perception would be unknown. However, we would have the knowledge that this issue is not resolvable, and that we must therefore adjust the aims and practice of our research and presentation to reflect this uncertainty. We need not be too pessimistic about this approach; whilst a particular body of evidence may support a number of interpretations, it will not support absolutely any interpretation (Thomas, 2015b). A third option would be to ignore this problem, as is the current trend, even when identifying it. It is hoped, however, that researchers would have the courage not to take this path.

The final potential outcome for this work is an inconclusive result where it is not clear to what extent, in a modern context, culture affects perception of the landscape. Such a result would limit the conclusions which can be drawn from the experiment, however it would not render this work useless. The importance of investigating perception in relation to archaeological knowledge creation will have been highlighted, and one of the central problems of archaeological interpretation brought to the fore. Whilst this methodology may prove unsuccessful in determining the relationship between culture and perception in a landscape context, it would not mean that there is no methodology which can successfully explore this relation. A failed experiment is not a useless one; it is merely one step along the path of finding the correct way to investigate an issue. Should this experiment not obtain data of use in determining the effect of culture upon landscape perception, the lessons learnt will be of great use in designing future work. Finally, should the results of the experiment prove inconclusive, it may be that the crowdsourced interpretation methodology is still of use in assessing previous interpretations, identifying important aspects of the landscape to attend to and understanding site visitors.
6 Methodology

6.1 Introduction

The perceptual experiment described in this chapter attempts to clarify to what extent perception of the landscape is cross-cultural in a modern context. Utilising the concept of Perceptual Uniformitarianism, discussed in Chapter 5, the data collected from this experiment will be used to address the central research question of this thesis, “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?”

Section 6.2 discusses the requirements of the landscape used for the experiment and Section 6.3 the wider impact of this experiment in the context of that landscape. Section 6.4 looks at experimental design, whilst Section 6.5 discusses a pilot study which contributed to the design of the final experiment. This final design is detailed in Section 6.6, and Section 6.7 details the analysis that the resulting data will undergo. The rest of this section will give an overview of the experiment and define its aims.

6.1.1 Experiment Overview

This experiment will take the form of a questionnaire, administered to people from a range of demographic backgrounds, in a single landscape. The questions will focus on visuo-spatial aspects of this landscape, drawn from onsite observations and, where relevant, published hypotheses. The focus will be on lower order concepts, such as size and position, since these are directly perceptual. However, some higher-order concepts which build upon these prior perceptual concepts will be included. The questions must be as non-leading as possible, so as not to influence responses, and thus get as true a reflection of participants’ natural perception as possible. The results of this experiment will be used to assess whether and to what degree there are common observations between different groups within certain demographic categories. Each demographic variable will be assessed for its impact on participants’ responses. Major practical considerations for the design of this experiment include: finding participants from an array of demographics, encouraging participation and getting participants to the landscape.
6.1.2 Experimental Aims and Objectives

The perceptual experiment has a number of aims which have driven its design. The previous chapters have demonstrated the need for an ecologically valid experiment to further research into cross-cultural variation in perception. Whilst the review of existing evidence has given certain indications, a number of key questions have been left unanswered, especially about the perception of landscapes. As such, no definite conclusions about the effect of culture upon visual perception can be drawn. The first aim therefore, is to contribute towards research into cross-cultural variation in visual perception. The second and primary aim of the experiment is to discern to what extent visual perception of the landscape is the same across different cultures, within a modern context. This evidence will then be used, in conjunction with the principle of Perceptual Uniformitarianism, to determine to what extent perception of the landscape may vary between modern and past people. The collection of evidence targeted at answering the central research question of this thesis will allow much stronger conclusions to be drawn.

In order to fulfil these aims a number of objectives first had to be met:

1) Select a suitable landscape in which to conduct the experiment- It is fundamental for the logistics and content of the experiment that an appropriate landscape is used. The primary consideration was that it be practical to conduct the experiment there in terms of access, permissions, and its ability to handle a large number of visitors. It would also be preferable for it to have archaeological features, in order to test the aspects of perception which are of interest to archaeologists. A further benefit would be a landscape with a broad selection of hypotheses concerning its spatial structure to draw from in formulating a questionnaire.

2) Define the demographics which will constitute the variables of this experiment- Demographic variables, such as cultural background and archaeological knowledge, were selected based on their potential to inform us about the variability in perception. A broad range of variables could be selected, but those which were deemed to be most relevant and practical in a self-identifying context were used. The more demographic variables chosen, the more participants would be required in order to ensure that subsequent analysis has adequate statistical power. Each category covering the
different combinations of demographics would ideally have enough people to ensure that potential intra-group variation is suitably represented.

3) *Create a questionnaire to test perception of the landscape-* The questionnaire was based on the aspects of visual perception of landscapes identified in the literature review. Questions were derived from published hypotheses and on-site observations of the author.

4) *Develop materials for delivering the questionnaire to participants-* Initial plans involved developing an app-based questionnaire, with the possibility of paper based copies as a backup should demographic data indicate that certain groups, such as older participants, were under represented. Ultimately, it was decided that a web form hosted on a dedicated website was the best way to deliver the questionnaire.

5) *Devise and implement a strategy for recruiting participants-* One of the most important but challenging aspects of running this experiment was the recruitment of participants. An experiment such as this one, with its range of variables under scrutiny, required a large population sample. It was also important that participants from a wide enough range of cultures were found.

6) *Use the results to fulfil research aim five of this thesis-* The ultimate deliverable is a series of measures of to what extent, and with what reliability we can state different demographic variables affect visual perception of the landscape. In order to fully understand the effect of culture it is necessary to have some understanding of other variables which may contribute to any variance in an individual’s response. Whilst correlation is not causation, and there are always other potential contributing factors, a strong correlation within a single variable of those selected would be highly suggestive of a link. The directionality of any implied causation would not be in question due to the nature of what is being studied; one’s perception of the landscape does not cause one’s background culture, for example. The results will therefore be carefully scrutinised, and their significance discussed, both for this thesis and archaeological research more widely.
6.2 Landscape Location

Landscape representativeness is not a concern for the core aims of this experiment, however, since this research is concerned with archaeological landscapes, it makes sense to carry it out in a landscape with visible archaeological features. This will allow for the visuo-spatial relationships which dominate archaeological landscape studies to be tested cross-culturally. This landscape need not be suitable for crowdsourced interpretation (if there can be suitable or unsuitable landscapes, as none are complete/pristine), although ideally it would be, so that this methodology could be tested at the same time. Instead, practical considerations, such as accessibility, cost of getting participants to the landscape and the numbers which can be accommodated must take priority.

There are a number of landscapes in the south of England, where the author is based, which have enough extant archaeological remains to be suitable for this experiment, and each has differing levels of practicality. One stands above all others however, not just because of the suitability of the landscape, but because it also offers solutions to finding enough willing participants; this is the Stonehenge landscape.

The landscape around Stonehenge contains a significant number of standing monuments visible from the publically accessible area around the stones. It has also been the subject of much interpretation, offering plenty of material from which to form the experiment’s questionnaire. Amongst these there are many references to spatial relations, such as grouping, orientation and positioning, key aspects of visuo-spatial interpretations. It is also a protected landscape, allowing the results to be tested with further work, without fear of changed stimuli, an important feature of any experiment.

Equally important is that Stonehenge is a major international tourist attraction. In 2017 there were 1,582,532 visitors, around 4,359 a day (over the 363 days which the site is open), and these came from all over the world. This means that there are a large number of potential participants which meet the requirements of this experiment, and that there is no need to seek out and transport participants; this significantly decreases time and monetary investment. The number of visitors also increases the chance of getting enough participants in each demographic category to ensure statistical power. There is no guarantee that tourists
will want to take part in the experiment, but their presence suggests at least some interest in the Stonehenge landscape, and as noted in the 2005 Stonehenge research framework (Darvill, 2005) many visitors are keen to get involved in archaeological research. This enthusiasm is a potential source of bias, however, they do not necessarily have much archaeological knowledge, and it would be very difficult to recruit participants with no interest. Having participants come to the landscape themselves, rather than transporting them there, also means that little day to day management is required to keep the experiment running, and there is no extra cost in additional participants taking part.

Stonehenge also offers a number of problems for this experiment, the greatest of which is the potential for biasing responses. Due to the large amount of information available at Stonehenge from notice boards, the guide book, audio guide and visitor centre, it is possible that participants’ responses will be influenced by current archaeological thought. Much like a landscape reconstruction, it is a curated experience. This is obviously a problem given that this thesis seeks to assess current archaeological practice; if the results of this experiment are entirely influenced by that practice, then any conclusions drawn will be invalid. However, given the significant benefits of using the Stonehenge landscape, it is better to mitigate these factors than use another landscape. This has been done through careful choice of questions, to avoid asking about things directly described in the guide materials where possible, and identifying those participants who made use of these materials and those who did not. Stonehenge has so many visitors that there are likely to be a significant number of people who do not listen to or read the guides. These can be identified in the questionnaire and the effect of guide use analysed.

6.3 Experiment Impact

The main aim of this experiment is to contribute towards the research question of this thesis, and Stonehenge has been chosen because of the benefits for this research, however it also contributes to a number of the aims identified in the 2005 and 2016 Stonehenge research frameworks (Darvill, 2005; Leivers and Powell, 2016). The frameworks define the avenues of research considered most important, questions which need answering and activities which require attention in the Stonehenge landscape. The 2005 framework was set out as a number of issues and objectives designed as a holistic guide to future work. The 2016 framework was
divided into themes and research questions. A number of elements from both are relevant to this research, and whilst the 2005 framework is now thirteen years old, many of its key elements are still relevant and are represented in the 2016 framework.

*Issue 18, “The relationship between physical access, experience and people’s sense of place”* (Darvill, 2005: 116), *Research Question J.3 “What patterns are evident in the spatial relationships between the locations of barrows and the existing monuments...” and the research theme “Burials and Barrows”* are the most relevant for this thesis (Leivers and Powell, 2016: 12, 18). The former specifically talks about the sub-division of space, an important part of visuo-spatial interpretations, and asks how modern experience of space relates to past experiences. The elements from the 2016 framework tie directly into visuo-spatial approaches to landscape, and so all these elements directly relate to the research question of this thesis and the aims of this experiment. Aspects of *Research Question C.10*, including “*What do we know of the locations of monument construction?*” and “*What can be inferred of late 4th and early 3rd millennium BC mortuary practices and their monumental settings?*” are also relevant in this regard (*ibid.*: 17).

*Issue 32, “The human experience of the research process”,* notes that visitors to Stonehenge have an interest in the archaeological research process and how we get from archaeological evidence to accounts given in guide books and on signs (Darvill, 2005: 119). It also states that most visitors have questions about the area, and that from their perspective, the best part of Stonehenge is the mystery (*ibid.*). It therefore asks whether the “*thrill of uncertainty*” can be harnessed (*ibid.*). This ties closely into the perceptual experiment, which will highlight just how much mystery is left in archaeology, despite the impression often given by media presented to the public. It will also give them insight into the interpretive process, expand their thoughts beyond basic ‘what?’ and ‘when?’ questions, and most importantly get them directly involved in archaeological research. This experiment can give greater context to the information participants are presented with at Stonehenge, and gives them agency in the archaeological process, thus improving the visitor experience. This ties directly into *Principle 4* of the 2016 framework (Leivers and Powell, 2016).

Finally, *Objective 1, “Investigate the essential importance and distinctiveness of Stonehenge past and present”,* notes that a wide range of perspectives are required in order to
understand the importance of Stonehenge, yet this is described as “lone researchers brought together... through workshops” (Darvill, 2005: 126). Such an approach fails to meet this objective; archaeologists do not represent a truly broad view, but a particular conditioned one, which may not do justice to the full range of perspectives, especially those held by people in the past. It is therefore important to expand beyond the discipline to understand the Stonehenge landscape; formulating a crowdsourced interpretation from as wide a range of views as possible is one of the secondary objectives of this research.

Conducting this research in the Stonehenge landscape then, will not only address practical issues in carrying out the perceptual experiment, but can further the agenda of the Stonehenge research frameworks. In general, this experiment will contribute significantly to the impact of this thesis, increasing the confidence in any conclusions drawn and helping to further archaeological and perceptual research, as described elsewhere.

6.4 Questionnaire Design

The questionnaire is the most important part of this perceptual experiment, as it is the means of collecting data on participants’ visual perception of the landscape. Its structure and questions need to be such that the data is unbiased and an accurate reflection of participants’ perception. The questions will need to address issues such as distances, orientations, proximity, links to natural features, groupings and containment in such a way that participants are not led into giving particular answers, but those which come naturally. Using structured questionnaires without doing this can be difficult, “it is impossible to ask someone whether he agrees or disagrees with a proposition without putting the subject of the proposition into his mind” (UCL, 1972: 35).

The best approach for gaining high quality and accurate data would be cognitive interviewing (Willis, 2005), as it might be possible to guide participants into talking about the subject of visuo-spatial relations without overtly drawing their attention to archaeological norms. This approach is very time consuming and requires direct engagement however, and it is therefore difficult to get enough participants for a quantitative study such as this (ibid.). It would also prevent visitors who did not speak English from taking part. Given the numbers
required to investigate multiple demographic variables, a self-conducted questionnaire survey is a far more suitable approach for this study.

Putting ideas into participants’ heads is just one source of potential error; Willis (2005: 14) defines six sources of error in surveys. These are:

- **Coverage error** - Certain groups of people having no opportunity to take part
- **Non-response error** - Certain individuals/ groups not responding to the survey
- **Sampling error** - Participants may not be representative of their population
- **Response error** - Characteristics of the questions or respondents may cause errors
- **Processing error** - Errors in the processing of data
- **Interpretation error** - Errors in the interpretation of survey results

Processing error and interpretation error are of course a problem for any study, and there is no guarantee that they do not apply, however, every effort will be made to avoid these having an impact upon the study. The other sources of error are more important for the design of this experiment and are where the key limitations lie. Coverage error is unavoidable with this experiment; the necessity to be at Stonehenge automatically limits the participants to those that have come to the UK. Those who cannot for financial or political reasons, for example, are excluded from taking part, and there is no practical way to overcome this. There are also those that are in the UK but who do not go to Stonehenge, for which there may be a wide range of reasons. This is less likely to have an influencing effect, except interest in heritage potentially causing different attendance rates. One could argue, however, that as a world famous site and one of the UK’s major tourist attractions, many tourists will visit it whether they have an interest in heritage or not. This can be traced through the survey, however it would require an additional demographic variable, increasing the number of participants required significantly. However, one would expect an interest in heritage to be reflected in some level of knowledge about it, and so the variability and effect of this may be discerned by asking participants about their archaeological knowledge. This has already been identified as an important variable to include and so these issues can be combined, removing the need for additional participants. This also prevents problems in data analysis caused by having two closely linked variables (Oppenheim, 1996: 24).
Non-response error is closely related to coverage error; whilst many people may come to Stonehenge, only a small percentage are expected to respond. Those that do may have certain characteristics which distinguish them from those that do not. Again the most likely cause of this is interest in heritage, but there are other potential influencing factors, such as the method of survey delivery, the available languages, the difficulty of questions, time restrictions etc. Certain aspects of coverage error cannot be overcome, and whilst steps will be taken to allow as many people to take part as possible, non-response error will still be a factor. This will be evident if there are any demographic groups which are clearly under represented.

Responses may suffer from sampling error, in that the participants are not wholly representative of their respective populations. The extent of sampling error (as well as some of the effect of coverage and non-response error) can be determined by comparing participants to their respective populations. One might, for example, compare the range of German people who respond to the latest German census data, and thereby establish how representative a sample they might be. Where possible census data will be used in this way in the analysis of the experimental results.

Finally, response error will be a key consideration. The intention is that the people taking part in the survey will be from a wide range of backgrounds and have different levels of knowledge and experience of archaeology and British landscapes. This introduces a wide range of possibilities for bias due to how they respond to the questions, aside from their actual perception of the landscape, and will also likely lead to an increase in response variation due to misunderstandings (Willis, 2005; Brace, 2008). To avoid this, questions must be as simple as possible, whilst still addressing the key questions of this thesis. The questionnaire must also be carefully structured and worded to get natural responses; again we must be wary of putting ideas into peoples’ heads (UCL, 1972: 35; Brace, 2008: 40, 53). In order to gauge people’s perceptions in this way, open ended, non-leading questions can be used (ibid.; Oppenheim, 1996: 125), however this has the effect of increasing the possibility of response error, especially due to question vagueness (Willis, 2005: 17). The result may therefore be answers that are completely irrelevant to understanding how people perceive visuo-spatial relationships. One might ask an open question about a barrow, for example, and
get answers back such as “it is covered in grass”. Whilst this may tell us something about what that person thought significant enough to mention about the monument, it does not contribute to the aims of this study. Presenting very narrow questions or pre-defined answers meanwhile, risks simply reproducing archaeological norms. In order to get around this, a questionnaire can start with more general questions, before narrowing down to more specific questions, or use open ended and then multiple choice questions. Multiple choice questions can also serve to show what participants know or recognise, and not what simply springs immediately to mind (Bruce, 2008: 51). Having access to both of these sets of information could be very valuable.

As well as limiting the range of possible responses, multiple choice questions can also have in-built bias that preconditions certain responses (UCL, 1972: 44; Brace, 2008). In order to alleviate this, both the positive and negative of a statement should be presented in questions, where relevant, and answers should not always be in the same order (Ibid.). With an online questionnaire, such randomisation can easily be implemented. Finally, a more positive response to questionnaire length, increasing the number of people that complete it, can be gained by starting with easy questions, following with those which are more difficult, and ending with straightforward ones (UCL, 1972: 44). The structure of the questionnaire, starting with demographic information and ending with multiple choice questions fits this well.

Oppenheim (1996: 5) notes that association does not prove causation or its direction; however, given that most of the variables under study in this experiment are basic unchangeable characteristics, not influenced by behaviour, any strong associations can be argued to be causal. Any such association cannot be proven to be the only causal factor, since other attributes may have an effect on visual perception of the landscape; however, those which seem most likely are included in this experiment. To be confident in the findings it is important that no two variables are closely linked (Oppenheim, 1996: 24).

As this experiment does not contain experimental and control groups, it has a factorial design, in which multiple variables are looked at in conjunction (Oppenheim, 1996: 26). In a factorial experiment the number of participants must exceed the value of all of the variables’ categories multiplied together, and there must be enough participants within each individual combination to be statistically valid (Oppenheim, 1996: 25; Field, 2013). For example, two 198
gender categories, five cultures, five levels of archaeological knowledge, and four age categories would require at least 200 participants, before considering the need to have more than one person in each demographic combination. Whilst some variables can be pre-divided into categories, others must be entirely self-identified. The questionnaire design, and responses to it, therefore directly influence the amount of data required.

Each of these design principles were considered in the production of the final questionnaire, its delivery method and the analysis to which the data will be subjected.

6.5 Pilot Study

In order to test the feasibility and better understand the requirements for undertaking an interpretive experiment of the type proposed, a small pilot study was undertaken in 2011. The goals of this pilot were as follows:

- to test the method of investigation in order to determine whether it was a practical means of getting the data required to answer the research question of this thesis;
- to test the method of question delivery;
- to apply the principles of questionnaire design in order to better understand them, and their effect on participant responses;
- to test the types of questions to be asked and how best to ask them;
- to establish if the intended demographic questions were appropriate, or if any seemed redundant in practice;
- to gain feedback from participants to further improve future questionnaire design.

The pilot was undertaken with first year undergraduate students from the University of Southampton on a field trip scheduled to explore the archaeology of Bokerly Dyke and Down Farm, Dorset. Prior to the trip, field visits were undertaken at both landscapes, and these, along with research into existing studies of the landscapes, were used to guide the selection of questions. The pilot questionnaire can be found in Appendix 1.

Due to circumstances on the day, the visit to Down Farm was cancelled, and the students were taken to Knowlton Henge instead. This resulted in any specific questions from the second half of the questionnaire being irrelevant, and so only questions which were more
general in their scope could be answered. This reduced the ability to directly compare answers to the intended nature of the inquiry.

An initial review of the data acquired from this pilot study suggested that this sort of experiment could result in data which was able to be used to address the research question of this thesis. There was variation in answers from the students, demonstrating that there is the possibility for different responses to the sort of questions being asked, but they were not all so wildly dissimilar from each other as to preclude any grouping of answers and assessment of groups of answers. In categorising different answers, it became clear that whilst an easy way to deliver a questionnaire, the amount of data entry and manual handling required, even for a small number of questionnaires, was fairly significant. For the numbers required for the main experiment there would therefore be a very significant investment of time. As such it was decided that a digital only approach would be adopted, as this would allow some level of automation in the data handling. Whilst this may reduce the uptake of participants, the ubiquity of smartphones should mean that this will not have a significant impact. The most likely impact which may be seen is a reduction in older participants, who are less likely to regularly use such technology.

In looking at responses it seemed that most participants complied with instructions and did not return to the open question sections after having looked at the multiple choice questions. However, some changes in responses were evident, which may have been a result of this. Avoiding this potential source of bias is another reason to use a digital questionnaire. The concept of using open questions and then multiple choice questions seems to be of benefit, as suggested in the questionnaire design literature (UCL, 1972; Oppenheim, 1996). A number of the open ended questions had quite a broad array of answers which were difficult to categorise for analysis, in part perhaps because of the question wording (not all answers seemed entirely relevant to the question’s intent). Having more narrowly focussed multiple choice questions will therefore definitely be of use, to ensure a targeted set of responses and guarantee a data set which can be analysed.

Question responses and feedback from participants demonstrated that the wording of questions has to be carefully considered to ensure that their intent is understood. In some instances, the students could not tell what feature a question was referring to due to a lack
of requisite knowledge of what it looked like, a failure to spot it, or mistaking something else for it. This suggests that some additional information may be required to guide participants. However, whatever format this takes, it could have a biasing effect on responses. Indeed the failure to notice something, is important evidence in itself. It may therefore be appropriate to note in the questionnaire that “I don’t know what this means” or “I can’t locate this feature” are appropriate responses. This also raises the prospect of trick questions; these could be of use in identifying respondents who are answering even if they do not know what a question refers to. It could also allow investigation of the effect of authority bias on participants’ responses and our interpretation of landscapes in general. Ultimately, it was decided not to use trick questions, due to the additional questionnaire length and complication it would create. The careful wording of the questions required necessitated small test runs of the final experimental questionnaire on non-archaeologists. This allowed questions which were too vague or too leading to be identified. These test runs also served as functionality tests for questionnaire delivery via a website.

There were not enough participants in the pilot study to subject the results to any significant statistical analysis, however, this was not the intention of the pilot. It was understood from the outset that a significant number of individuals would be required to undertake analysis with sufficient statistical power. With the demographic responses from the 16 individuals in this pilot, a sample size of at least 1600 people would have been required to facilitate log-linear analysis (Field, 2013). Upon reflection of the way the demographic questions were asked in the pilot, a number of changes were made to better reflect the original intention of the questions, better control the requirements for statistical testing and to be more inclusive. The question of archaeological knowledge is better stated as knowledge of landscape archaeology, as an expert in Roman pottery would not necessarily have any additional insight when it came to landscapes. The use of only male and female for gender identification also now seems an obvious oversight.

This pilot study does not directly contribute to the answering of the central research question, but it did offer significant insight into the experimental and questionnaire design processes. This allowed for a more robust methodology and a more informed final questionnaire, which is detailed below.
6.6 Fieldwork Method

The perceptual experiment will be carried out by administering a questionnaire to the participants, asking them about archaeological visuo-spatial relations in the landscape in which they stand. They will be free to explore it as much as they wish whilst answering, as restricting their interaction will impoverish their perceptual experience (Gibson, 1986). The questions focus on groupings, orientations, relationships to landscape features etc. which have been drawn from landscape visits, landscape archaeology studies in general and studies of Stonehenge. Some questions will address broader issues in landscape archaeology, and others are more specific. The full list of Stonehenge literature consulted and potential visuo-spatial relationships to include in the questionnaire would be too long to practically list, and much of this material was discarded in the selection of questions. There are a number of reasons for this, including the ease of asking questions about the relationship, the ability to experience that relationship from the accessible area immediately around Stonehenge, and questionnaire length. Having drawn up a short list of questions, the best were selected with the intention of having, where possible, an open ended and multiple choice question about the same type of visuo-spatial relationship, but in relation to a different subject. Relationships which have been drawn from the literature include: the presence of various barrow groups upon ridges (Richards, 1990; Cleal et al., 1995; Snowden, 1997; Darvill, 2006; Field and Pearson, 2011; Chippendale, 2012); barrow clustering and orientation (Richards, 1990; Cleal et al., 1995; Darvill, 1997; Snowden, 1997); the position and effect of the Stonehenge Cursus in the landscape (Snowden, 1997; Pearson and Field, 2011; Pearson et al., 2015); the shape and nature of the horizon (Cleal et al., 1995; Darvill, 1997; Darvill, 2006) and the topography of the landscape (Field and Pearson, 2011).

A vital part of this experiment is demographic data; this comprises the first section of the questionnaire, identifying age, gender, cultural background, archaeological knowledge and familiarity with English landscapes (see Table 6.1). Each of these could have an impact on how the participants perceive the landscape, and need to be analysed in order to discern the cause of any difference. They also overlap with those used in museum studies (Alpin, 2003: 39-40; Black 2005: 10-11). Numerous studies have shown that age and gender cause differences in mental activity (Berg et al., 1982; Devlin and Wilson, 2010; Johnson and Bouchard, 2007;
Maeda and Yoon, 2013), and past experience of landscapes may determine a frame of reference which affects one’s perception of new landscapes.

**Table 6.1- Demographic Variables**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Knowledge of British Archaeology</th>
<th>Familiarity with British Landscapes</th>
<th>Cultural Background</th>
<th>Use of guide materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>18-29</td>
<td>None/ Very little</td>
<td>None/ Very little</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Female</td>
<td>30-59</td>
<td>Some general knowledge</td>
<td>Spent a small amount of time in them</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td>60+</td>
<td>Final year student/ Amateur landscape archaeologist</td>
<td>Occasionally visit/ long term resident of Britain</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Postgraduate</td>
<td>Frequently visit them/ lifetime resident of Britain</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

In order to reduce the statistical requirements, age has been assigned defined ranges (informed by UK census categories), gender is split into male, female or other, and archaeological knowledge is divided into five categories. Length of time in Britain (a demographic variable in the pilot) has been reformulated into familiarity with English landscapes in order to better represent the original intention of this variable. Additional categories could have been created, allowing participants to better represent themselves, and allowing a more granular analysis, however, this would have increased the number of participants required. Cultural background will be self-identifying, though some responses may be amalgamated if they are similar but worded differently.
Due to its factorial design, assuming 10 distinct cultural backgrounds are self-identified, it was originally calculated that at least 1,800 responses would be required to ensure adequate statistical power of this experiment according to indications given by Oppenheim (1996: 25). Should the guide materials prove to be an important factor in participants’ responses, this would increase to 3,600. This is a large number of responses, however given the intended data collection duration of 171 days, this represents only 0.22/0.44% of the estimated visitors to Stonehenge, based on visitor numbers from 2016. When yearly visitor numbers are calibrated against quarterly statistics for visitors to the South West (Office for National Statistics, 2016), this reduces to an estimated 0.25/0.50% of visitors to Stonehenge over this period that would need to respond.

After the experiment was started further research into log-linear analysis revealed that these participant requirements were too low as there is a requirement for 80% of the cells to have more than five responses, and the number different question responses increases the number of cells (Cohen, 1998; Field, 2013). Neither of these points was laid out in any of the literature consulted factorial experiment design. The numbers required for the experiment, prior to considering answer categories, were therefore 9,000 and 18,000. Though this would still only represent 1.1/2.2% of visitors over the duration of the experiment. As is discussed in Chapter 7, not all demographic variable options were selected by participants, reducing the starting requirements.

Whilst the structure of the questionnaire is important for gathering quality data, the method of presenting it is also important. It needs to be easily accessible and ideally require very little management on a day to day basis. In order to meet both of these goals, it was decided to deliver the questionnaire through an online form hosted on a dedicated website. This involves relatively little management once the experiment is running, and allows some automated data management. Due to concerns regarding the stability of Wi-Fi connection at Stonehenge, the entire questionnaire was placed on one page, rather than splitting the sections as originally intended.

In order to allow as many different people to take part in the experiment as possible, the questionnaire was translated into five additional languages: French, German, Mandarin, Portuguese and Spanish. These were selected based on a combination of factors. The first
was the number of global speakers, the second, an estimation of the likelihood that native speakers visiting the UK would speak another language within the top most spoken languages, and finally the ease of having translations checked. For each language, the questionnaire was translated using three separate online translation tools, cross referencing between them, and translating back into English, to determine the optimum translation. These translations were then checked and refined by individuals fluent in each language. The Mandarin translation proved to be more difficult and so a professional translation service was used.

There are a number of factors which may affect the results of this experiment, some of which, such as potential sources of bias have already been discussed. Other issues include people giving dishonest or non-serious answers, conferring with others, or going back to the first section having seen the multiple choice answers. The introduction to the experiment instructed participants no to do this, however it was not possible to prevent them from doing so. Ultimately, this is one of the pitfalls of such research and it is hoped that such responses will be infrequent enough to be insignificant.

One final element which was considered was asking participants to draw maps of the landscape; given the discussions in Chapter 4, it was thought that this would be an interesting addition. However, this was not implemented, primarily due to the difficulty of doing so with an online questionnaire. Additionally, it was unclear what analysis they could be subjected to without a large amount of work analysing the different representations in GIS; this could form a standalone project in itself. Further to this, in order to alleviate some of the issues of identification encountered in the pilot study, a very basic map was included in the questionnaire for reference. The final questionnaire can be found in Appendix 2, along with annotation regarding question intent.

Following ethics approval (Appendix 14) and meetings with English Heritage (EH) to confirm permission and procedures, participants were recruited through the use of posters at Stonehenge, and social media posts advertising the experiment. These posters included all of the languages available for the questionnaire. Participants were self-selecting, and the only inclusion criteria was that they be over 18. Confirmation of consent was provided by a tick box on the questionnaire.
6.7 Analysis and Data Uses

Participant demographic data will form the basis of the analysis, which will identify the extent to which the attributes have a causal effect on landscape perception. Whilst the central aim of this research has been an assessment of the effect of culture, other possible influences are equally important to understand. In order to further understand the effect of each demographic variable, intra-group variation and the relative weightings of each variable will also be considered. The data analysis will also consider differences demonstrated between questions addressing different elements of spatial perception. This will give insight into what aspects of spatial perception can be considered cross cultural in a modern context, and to what extent.

Statistical tests have been chosen which allow the identification of associations between variables and outcomes in categorical data. A chi-square test will be carried out for each question and each demographic variable to determine if there is a correlation; this allows the effect of each variable upon responses to be considered in isolation. These will then be discussed together to assess the effect of the variables. Each question will also be subjected to multinomial log-linear regression to determine the strength of any association effects and whether multivariable interactions may have an effect upon responses. If the effect of culture is not significant across all of the questions, for example, then we can argue that it does not greatly affect visual perception of the landscape.

Through the application of Perceptual Uniformitarianism, the results of this analysis will be used to help answer the research question of “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?” If culture is shown to have an effect upon perception of the landscape in a modern context, then Perceptual Uniformitarianism argues that archaeologists’ perception of the landscape will be different from past people. This difference is likely to be at least as large as the most differing groups in the experiment. Should culture be shown not to have an effect on perception of the landscape in a modern context, then Perceptual Uniformitarianism argues that culture would not have had an effect in the past; therefore our perception of the landscape is likely to be the same as past peoples’. It may also be the case that culture affects certain aspects of perception of the landscape and not others. It is possible that responses
will vary widely but that none of the variables assessed will be identified as significant contributors to the variation. If this is the case it may be that landscape perception is a very individual phenomenon, or that another variable (or group of variables), which was not considered has an effect.
7 Results

7.1 Introduction

This chapter begins with an overview of the data collected as part of the perceptual experiment, before providing a statistical analysis of the data. The analysis is split into five sections, starting with descriptive statistics, highlighting overall trends of interest, before moving onto Fisher’s Exact Tests and log-linear regression, which will analyse the effect of the demographic variables upon responses to the questionnaire, and finally analysis of a collapsed dataset. A discussion of what these results mean for this thesis will form part of Chapter 8.

Data collection took place over 24 weeks. The total number of participants in the experiment was 40, which represents approximately 0.005% of visitors during this time. This number is considerably fewer than those required to fill each cell within a factorial experiment and so all of the analysis in this chapter must be viewed through the lens of a very low statistical power. Reasons for the low number of participants will be discussed in Chapter 8.

All of the pre-identified demographic variables were used by participants, except for Other within the gender category. Eight separate cultural backgrounds were self-identified, these were; British, Chinese, American, Asian-American, South African, French-German, Brazilian and Australian. There was some variation in individual responses, such as English and European American which were collated with similar responses into the categories above. Participant distribution across the demographic variables can be seen in Table 7.1. Individual responses and crosstabulations of the variables (the number of participants that fall into each possible demographic group) can be seen in Appendices 3 and 4 (Appendix 4 is on the accompanying DVD).

Given the factorial design of this experiment (Oppenheim, 1996: 25), and the self-identification of cultural background, the exact number of participants required for statistical significance was always an unknown; although estimations of the number of individual cells with different demographic groups were made in Chapter 6. The demographic categories of participants that took part meant that the final number of cells is 1,920. As such, not enough
responses were collected to have data for each cell. Adjusting for the seasonal spread of visitors, this represents approximately 0.24% of the visitors to Stonehenge in this period, if we allow for no duplication between participants on particular combinations of variables.

Table 7.1- Participant Demographic Distributions

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>%</th>
<th>Culture</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>20</td>
<td>50</td>
<td>British</td>
<td>26</td>
<td>65</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>50</td>
<td>Chinese</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>5</td>
<td>12.5</td>
<td>American</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>30-59</td>
<td>27</td>
<td>67.5</td>
<td>Asian American</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>60+</td>
<td>8</td>
<td>20</td>
<td>South African</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>60+</td>
<td>8</td>
<td>20</td>
<td>French German</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Familiarity with British Landscapes</th>
<th>N</th>
<th>%</th>
<th>Knowledge of British Archaeology</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None/Very Little</td>
<td>3</td>
<td>7.5</td>
<td>None/Very Little</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>Some Familiarity</td>
<td>22</td>
<td>55</td>
<td>Some General Knowledge</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Familiar</td>
<td>5</td>
<td>12.5</td>
<td>Undergraduate/Amateur</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Very Familiar</td>
<td>10</td>
<td>25</td>
<td>Postgraduate</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of Guide Material</th>
<th>N</th>
<th>%</th>
<th></th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>30</td>
<td>Professional</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>No</td>
<td>28</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Given the small number of participants, especially in some categories, it is possible that participants are not reflective of their broader populations. The sample is too small to compare to census data, however it would be unlikely that each participant, or even all of those who fall into the less well represented categories, was distinctly unreflective of the wider population within the same categories. Analysis must therefore proceed under the assumption that the participants are representative of the broader population, and with an understanding that any conclusions drawn are very much preliminary, and require a wider sample in order to be corroborated.

210
7.2 Data Analysis

All data was compiled in IBM SPSS Statistics (V. 22) and coded according to participant responses. For open ended questions this necessitated some interpretation, and grouping of similar responses. Some responses were not appropriate for the question, likely due to a misunderstanding, others were clearly not intended to answer the question, and some were left blank. These responses were grouped under “Nothing or N/A”.

7.2.1 Descriptive Statistics

This section highlights notable trends in responses to each question independent of any variables. Tabulations of the distributions can be seen in Appendix 3.

7.2.1.1 Open Ended Questions

**Question 1) What do you notice about the sizes of the Cursus Barrows?** - 37.5% of respondents described the Cursus Barrows as of differing size, whilst only 10% described them as of similar sizes. However, a further 40% described them, as a group, according to their size, suggesting that they saw them as a similar size. There is a distinct trend to perceiving them as big, but a potentially split view on whether they were all the same size or not. Whilst perception of size in relation to other objects in general may be relatively well shared across responses, perceptual sensitivity to minor differences in size may not be. Of course, all of those who responded about the group as a whole may simply have seen that as the most important characteristic and so did not report on the relative sizes within the group.
Question 2) What do you notice about the location of the King Barrows? Responses were very varied to this question, necessitating that 17.5% of responses be classified as “Other”. 55% of responses overlap over five categories that cover the barrows’ location on a ridge, their relationship to the horizon and their proximity to trees. 40% of respondents stated that the barrows were on a ridge, 25% that they were close to trees and 7.5% that they were on the horizon. The ridge location and proximity to trees were therefore, by far, the most commonly indicated features.
Question 3) If you can, describe the distribution of the King Barrows- 62.5% of responses were split over “In a line”, “Equally spaced” and “Equally spaced line”. Again, a judgement about the most important factor may have been made. 40% of respondents stated that they perceived the King Barrows as in a single line, and only 2.5% as in two lines. 32.5% of respondents perceived the barrows as equally spaced, whilst 10% perceived them as unequally spaced. The linear distribution and/or spacing of the barrows was therefore present in 75% of responses, with little contradiction between responses.

![Bar chart showing distribution of responses for the King Barrows](image)

**Response Category**

*Figure 7.24- Q3. If you can, describe the distribution of the King Barrows*

Question 4) What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?- Response categories 2, 3 and 4 in Figure 7.4, could all imply that the ditch surrounds the uprights, meaning that 60% of participants perceived an enclosing relationship.

![Bar chart showing relationship between stone uprights and ditch of Stonehenge](image)

**Response Category**

*Figure 7.33- Q4. What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?*
Question 5) Describe the relationship between the two barrows to the left of the fence running towards Normanton Down- Response categories 3, 6 and 7 in Figure 7.5, all have some degree of overlap. A total of 55% of participants therefore perceived the two barrows as close to one another or attached. In total, only 7.5% stated that one occluded the other.

![Response Category](image)

*Figure 7.42* - Q5. Describe the relationship between the two barrows to the left of the fence running towards Normanton Down

Question 6) Describe the horizon around Stonehenge- There were 11 answer categories to this question (see Fig. 7.6), more than for any other question, although there is some overlap in answer categories. In total, 10% described it as high, 15% mentioned that it has tree cover, 7.5% that it has barrows and 15% that it varies, which could mean a number of different things but is suggestive of differing heights and feature presence. No clear dominant response stands out, but it is interesting that 25% of respondents noted features that sat on the horizon.

Question 7) What do you think is the highest point in the landscape?- There is a large degree of variation in responses to this question, as demonstrated in Figure 7.7. Stonehenge represents the closest major feature in the landscape, and the King Barrows the most distant clearly identifiable feature; clearly height perception is not a factor of distance from the individual. Topographic data shows that King Barrow ridge is approximately 10m higher than the ground level at Stonehenge, but the highest stone at Stonehenge is around 9m. The top
of Stonehenge and King Barrow Ridge are therefore a similar height, and are in fact the highest points visible in the nearby landscape, except for the hill immediately to the west of Stonehenge which is slightly higher, but the highest point of which may not be visible from Stonehenge. These three areas, which are of a similar height, account for 60% of the responses, 52.5% coming from the two which are almost identical. A further 7.5% of responses which state “East”, could also cover the King barrows. From this one could argue that most people’s height perception is very accurate, with only a handful of responses seeming to be incorrect, and a few more which are focussing on a wider area of the landscape.

Figure 7.51- Q6. Describe the horizon around Stonehenge

Figure 7.60- Q7. What do you think is the highest point in the landscape?
Question 8) Describe the relationship of the road to the landscape- The responses were very varied to this question. 30% of participants responded that the A303 cuts through the landscape, whilst 17.5% gave the contrasting response that it follows the contours. 5% stated that the road was very visible, and 5% that it was not.

7.2.1.2 Multiple Choice Questions

Question 9) Describe the terrain of the landscape- There is a strong preference towards describing the landscape as “Gently undulating”, whilst extremes descriptions are poorly represented.
**Question 10) The Cursus Barrows are...** - 77.5% responded that the Cursus Barrows were different shapes, indicating a strong trend, though discrimination of the exact shape differences varies. Interestingly a similar trend emerged in Question 1, which was also about the Cursus Barrows. There may be something about their position and orientation relative to Stonehenge which leads to increased uncertainty in exact size and shape perception.

![Figure 7.87- Q10. The Cursus Barrows are...](image)

**Question 11) Describe the role of the Cursus in the landscape** - All of the answer categories are observations which could be built from the same perceptual data. This question represents a look at higher order concepts, and as such it is unsurprising that responses varied widely.

![Figure 7.96- Q11. Describe the role of the Cursus in the landscape](image)
**Question 12) The King Barrows...** - 75% of respondents saw at least some of the barrows on the horizon. Clearly there is a lot of consensus about position in relation to horizons and this is a spatial characteristic which is widely perceived. This is a significant increase over the responses in Question 2, demonstrating the inherent bias in multiple choice questions caused by introducing an idea to respondents. It is also possible that this relationship was noted before, but that it was not deemed the most significant thing about the barrows’ location. Whilst positioning on the horizon may be something widely perceived, it may not be universally considered as important.

![Barrow Survey Results](image)

*Figure 7.105- Q12. The King Barrows...*

**Question 13) The Normanton Down Barrows are...** - 42.5% perceived the Normanton Down Barrows as on a ridge and 22.5% on elevated flat ground, meaning that the large majority of participants perceived the barrow group as on top of elevated ground. Whilst there is a difference between being on a ridge and a plateau, a relatively limited view point may make people discount the possibility of the topography forming a ridge. With its multiple choice answers restricted to topographic options, Question 13 had an increase in “On a ridge” responses compared to Question 2. Interestingly only 75% of those that answered in this way for Question 2 answered with “On a ridge or plateau” for Question 13. This means that despite the majority view, something about the location of the Normanton Down Barrows made 25% of respondents respond differently to the two barrow groups. Over half of those that
responded with “On a ridge” or “On elevated flat ground” for Question 13, made no such response for Question 2, again demonstrating the power of suggesting responses to participants through multiple choice.

**Figure 7.114-** Q13. The Normanton Down Barrows are...

**Question 14) Describe the relationship between the two barrows to the left of the fence running towards Normanton Down**- 67.5% perceived the two Normanton Down barrows in this question as close to each other, 15% noted that one occludes the other. Occlusion does not necessarily indicate closeness, as one may be some distance in front of the other, but in the context of this group those who perceived one as occluding the other also likely saw them as reasonably close to each other. Even if this is not the case, there is a very large level of correspondence between participants’ perception of distance in spatial relationships.

**Figure 7.123-** Q14. Describe the relationship between the two barrows to the left of the fence running towards Normanton Down
**Question 15)** *Describe the distribution of the Normanton Down Barrows*— 45% responded that the Normanton Down Barrows were unevenly spaced, 25% that they were in a line, 15% clustered and 2.5% that they were spread out. The two most frequent responses are again not mutually exclusive, but there are differences between being in a line and clustered, and being clustered and spread out. The response categories mean that it is possible that 42.5% saw the barrows as evenly spaced.

![Distribution of Normanton Down Barrows](image)

**Figure 7.132-** Q15. *Describe the distribution of the Normanton Down Barrows*

**Question 16)** *What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?*— 45% of those that responded with “Nothing” or gave no answer to Question 4 responded that the ditch encloses Stonehenge in this question, again showing the effect of introducing ideas through multiple choice categories. Those that responded “There is no relationship” also stated the same for Question 4; clearly the introduction of an idea does not bias all responses. Of the 20% that responded “The ditch matches the shape of the stones”, 75% of them stated in Question 4 that the ditch surrounds Stonehenge, or that they form concentric circles. Although it was not intended in the design, there is clearly an overlap in meaning here, suggesting that 82.5% of respondents perceived an enclosing special relationship.
Question 17) Describe the horizon around Stonehenge—The “Continuous” and “Interrupted” responses are clearly opposite to each other, suggesting a real degree of difference in perception. These responses are not mutually exclusive from “Acts as a boundary”. There is a distinct shift towards the idea of the horizon as a boundary, from the very varied responses to Question 6, with 47.5% of participants selecting that response. Again picking one primary option could be an issue here.
**Question 18)** Which is the closest to Stonehenge, Normanton Down or Cursus barrows?  - The Cursus Barrows are the closest, suggesting that most participants had very good distance perception. From the centre of Stonehenge, The Normanton Down Barrows are approximately 900-1000m away, whilst the Cursus Barrows are 590-750m away, making the difference a fairly large 25-34%. Even at the closest edge to Normanton Down the distance difference is significant. It is therefore interesting that 15% of respondents thought otherwise, further analysis may reveal a trend here, but eyesight may be another factor at play.

![Figure 7.159- Q18. Which is the closest to Stonehenge, Normanton Down or Cursus barrows?](image)

**Question 19)** Describe the distribution of the ancient man made things in the landscape- There is a strong trend towards perceiving the archaeology as clustered (75%), although there is some difference in where. Again, there is the potential of some overlap in answer categories, though those that responded “Clustered in specific areas” likely didn’t perceive them as exclusively in one area, elevation or topographic location. The high and flat ground responses might be seen as opposed, but it is possible to have high but flat ground. We cannot therefore confidently state that the 75% of participants actually perceived the locations of the clusters differently, just that they prioritised certain categories/ different levels of specificity.
Chi-square-Fisher’s Exact Test

Chi-square tests look at the relationship between two categorical variables (Field, 2013); for the purpose of this thesis this will be each demographic category and the question answers. The chi-square statistic is the sum of the standard deviation of each observation, from the expected result in each cell of the contingency table, if there were there no correlation between the variables (Field, 2013: 722). The standard test is Pearson’s Chi-square Test, however, as the Pearson’s Chi-square Test gives only an approximate significance value it can lead to erroneous results in small datasets, where the expected value of any cell within a contingency table is below five. For small sample sizes, the Fisher’s Exact Test gives more accurate, though slightly conservative, results i.e. significance is actually greater than that calculated (ibid.). This means that even with a small dataset the results of any analysis should be reliable.

The Fisher’s Exact Test has therefore been used for the analysis, and the results should be reliable despite the small sample size. 0.05 and 0.01 are common thresholds for significance, however these figures are arbitrary, and cannot be considered as absolute cut off points for significance (Sun et al., 2010). Because of this and the conservative results of the Fisher’s Exact Test, results up to $p=0.09$ have been discussed. Given the pairing of variables to question responses in these tests, one can assume the directionality of the association, with the

Figure 7.166- Q19. Describe the distribution of the ancient man made things in the landscape

7.2.2 Chi-square- Fisher’s Exact Test

Chi-square tests look at the relationship between two categorical variables (Field, 2013); for the purpose of this thesis this will be each demographic category and the question answers. The chi-square statistic is the sum of the standard deviation of each observation, from the expected result in each cell of the contingency table, if there were there no correlation between the variables (Field, 2013: 722). The standard test is Pearson’s Chi-square Test, however, as the Pearson’s Chi-square Test gives only an approximate significance value it can lead to erroneous results in small datasets, where the expected value of any cell within a contingency table is below five. For small sample sizes, the Fisher’s Exact Test gives more accurate, though slightly conservative, results i.e. significance is actually greater than that calculated (ibid.). This means that even with a small dataset the results of any analysis should be reliable.

The Fisher’s Exact Test has therefore been used for the analysis, and the results should be reliable despite the small sample size. 0.05 and 0.01 are common thresholds for significance, however these figures are arbitrary, and cannot be considered as absolute cut off points for significance (Sun et al., 2010). Because of this and the conservative results of the Fisher’s Exact Test, results up to $p=0.09$ have been discussed. Given the pairing of variables to question responses in these tests, one can assume the directionality of the association, with the
variables being the causal factor. Each demographic variable and question combination has been tested in turn. The null hypothesis for these analyses is:

*There is no association between the demographic variable and the answer given to the question.*

As a null hypothesis test, a low probability of no association does not necessarily mean that there is an association, and the effect size, in this case Cramer’s V, must also be considered (ibid.; Field, 2013). The effect size quantifies the extent to which the results are different from what would be expected if there were no association, and the statistic is ideally compared to previous experiments in the same field to judge the category, e.g. small, medium or large effect (Sun et al., 2010: 991). As looking at the effect of the demographic variables on the visual perception of the landscape is relatively unexplored territory, the standard values for Cramer’s V suggested by Cohen (1988) will be used; 0.1 low effect, 0.3 medium and 0.5 high. Effect sizes also have significance/probability values which show how likely it is that this effect size statistic would emerge if there were no association between the variables. The significance value for Cramer’s V can therefore be used to confirm the Fisher’s Exact Test result (Field, 2013). Significant Fisher’s tests and non-significant effects, or vice versa suggest problems with study design (Sun et al., 2010: 991).

All effects are reported as “Question A Fisher’s Exact Test significance, at $p=X$, with a Cramer’s V effect size of $Y$ at Cramer’s V significance $p=Z$”. Due to the size of the dataset, the contingency tables and chi-square test results for each category/question combination are on the accompanying DVD, in Appendix 5. Results of interest are mentioned below.

**Gender**- None of the questions showed a significant relationship and none had significant effects. Questions 5 (*Describe the relationship between the two barrows to the left of the fence running towards Normanton Down*) and 11 (*Describe the role of the Cursus in the landscape*) came close at $p=0.086$, a high effect size at 0.535 with $p=0.061$, and $p=0.059$, a medium effect size at 0.457 with $p=0.072$ respectively. Question 14, a multiple choice version of Question 5 has a very low significance at $p=1$. This might suggest that the multiple choice categories have removed frequent responses, thus forcing participants to choose an option other than what they initially perceived, however, cross tabulation of the two
questions shows a great deal of correspondence between them. The main difference is that 60% of those in the “Nothing or N/A” gave responses for Question 14; again the effect of multiple choice is demonstrated. Given that for both male and female participants there was a strong trend towards perceiving them as close together, it is likely that this marginal result is best interpreted as not significant. Questions 4 (What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?) and 8 (Describe the relationship of the road to the landscape), cover some of the same kinds of spatial relationships as Question 11 and also have low significance, $p=0.705$ and $p=0.363$ respectively; they are not directly comparable, however. With a more significant $p$ value and a looser relationship between the questions, one can argue that gender may have a medium effect upon responses to Question 11.

**Use of Guide Materials** - Only one of the questions showed a significant association, Question 1 (What do you notice about the sizes of the Cursus Barrows?) at $p=0.046$, with a large effect size of 0.512 with $p=0.054$. Question 5 (Describe the relationship between the two barrows to the left of the fence running towards Normanton Down) was close to significance, at $p=0.53$, with a large effect size of 0.557 at $p=0.064$. Question 5 matches Question 14, however this had a significance of $p=1$. As with gender, this is probably best interpreted as not significant, given the correspondence of responses between questions. Respondents to Question 1 were far more likely to suggest that the Cursus Barrows were different sizes if they had used guide material. This is likely a result of the free map, which annotates the barrows in different sized red circles. As other questions were not significant, we can analyse the rest of the data without splitting the sample by whether they used a guide, since it seems not to have unduly influenced participants, at least in a way recognisable in this sample. Analysis of Question 1 will have to bear this significant result in mind however.

**Age** - Only one of the questions showed a significant relationship, Question 12 (The King Barrows... - Relation to horizon) at $p=0.041$, with a medium effect size of 0.421 with $p=0.077$. This Cramer’s V result does not fall within the $p=0.05$ level, but it is close. This question overlaps with Question 2 (What do you notice about the location of the King Barrows?), though it is more narrowly focused. Age was not significant for Question 2, at $p=0.835$. The result for Question 12 may be an artefact of the sample not being normally distributed, with
far more participants falling into the 30-59 age category, and responses spread over fewer options than Question 2.

**Knowledge of British Archaeology**- Only one question showed a significant relationship, Question 19 (*Describe the distribution of the ancient man made things in the landscape*) at \( p=0.029 \), with a medium effect size of 0.380 but a Cramer’s V significance of \( p=0.297 \). This is a contradiction in the statistics that suggests a problem with the experimental design; some of the issues with the categories in Question 19 have already been noted above.

**British Landscape Familiarity**- Two questions showed a significant relationship, Question 12 (*The King Barrows...- Relation to horizon*) at \( p=0.019 \), with a medium effect size of 0.429 with \( p=0.046 \), and Question 13 at \( p=0.042 \), with a medium effect size of 0.403 at \( p=0.074 \). Both questions are related to the responses in Question 2, though this was not significant at \( p=0.645 \). Question 15 (*Describe the distribution of the Normanton Down Barrows*) was close to significance at \( p=0.064 \), with a medium effect size of 0.381 with \( p=0.159 \); here there is a difference in the Fisher’s and Cramer’s V significance. Like Question 19, Question 15 has some problems with non-mutually exclusive response categories which may have an impact, though the discrepancy is by no means as large. Question 3 (*If you can, describe the distribution of the King Barrows*) which also looks at distribution of barrows was not significant, however, at \( p=0.871 \).

**Cultural Background**- Five questions showed a significant relationship at the 0.05 level, Question 1 (*What do you notice about the sizes of the Cursus Barrows?*) at \( p=0.009 \), with a large effect size of 0.508 but a Cramer’s V significance of \( p=0.140 \), Question 3 (*If you can, describe the distribution of the King Barrows*) at \( p=0.021 \), with a large effect size of 0.534 at \( p=0.072 \), Question 4 (*What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?*) at \( p=0.022 \), with a large effect size of 0.530 but a Cramer’s V significance of \( p=0.125 \), Question 13 (*The Normanton Down Barrows are...* - *Local topography*) at \( p=0.022 \), with a medium effect size of 0.480 but a Cramer’s V significance of \( p=0.151 \) and Question 18 (*Which is the closest to Stonehenge, Normanton Down or Cursus barrows?*) at \( p=0.048 \), with a medium effect size of 0.434 but a Cramer’s V significance of just \( p=0.451 \). Question 19 (*Describe the distribution of the ancient man made things in the landscape*) was
close to significance at the 0.05 level at $p=0.081$, with a large effect size of 0.579 at $p=0.050$. This result is interesting given the issues with Question 19 elsewhere.

The results for Questions 1, 4, 13 and 18 are problematic, again suggesting a problem with the experimental design. Given the number of categories within the Cultural Background variable, sample size is likely a major contributing factor. Question 4 and Question 16 match, and given Question 16’s lack of significance ($p=0.428$), we can suppose that there is not an association between cultural background and responses to Question 4. The same could be said of Question 13 through its relationship with Question 2 (What do you notice about the location of the King Barrows?) ($p=0.151$), though there could be genuine differences between perception of the two barrow groups. Questions 1 and 18 do not have another question to act as a check, though Question 18’s Cramer’s V $p$ value is so high that it is likely that cultural background does not have an association with responses. The number of cells for Question 2 meant that the exact significance for Cramer’s V could not be calculated, but the approximate significance statistic is not significant.

As the use of guide materials was significant for Question 1, and therefore a potential external influencing factor on responses which might override other effects, a Fisher’s Exact Test was run for each other variable on Question 1 using only participants who did not use guides. There were no changes to significance in this test.

### 7.2.3 Multinomial Log-linear Regression

The previous section looked at each variable in isolation; this section deals with log-linear regression, which allows the examination of how different variables interact with each other to determine outcomes (Field, 2013). This analysis has been used to determine whether question responses have been influenced by any combination of demographic variables, and each question has been tested in turn.

Log-linear analysis builds a saturated model which perfectly represents the data, it then removes the highest order interaction (in this case the Age*Gender*Knowledge of British Archaeology*British Landscape Familiarity*Cultural Background*Guide Use*Question) and creates a new model (Field, 2013: 734). Expected frequencies for each cell are then compared to the observed frequencies, using the likelihood ratio statistic to determine if there has been
a significant effect upon predictive capability of the model. If there has not been a significant effect, these interactions are deleted from the model and the next highest order interactions are tested; this is called Backwards Elimination (ibid.). The next highest order interactions will be a group of interactions each with one variable, or the question responses removed. Once a significant interaction has been found, Backwards Elimination for that set of variables will stop (e.g. Age*Gender*Question, Age*Gender will not be tested), but other interactions will continue to be tested until every remaining interaction is significant. If a variable is removed entirely then it had no significant effect upon the predictive capability of the model; as with the Fisher’s Exact Test, we can assume the directionality of any association in this case, and therefore this variable is not a predictor for participant’s responses. In log-linear analysis, variables and outcomes are treated in the same way, therefore it is possible that the question responses will be identified as not significant and removed; this means that none of the demographic variables have had an effect upon participants’ responses.

Log-linear analysis creates a number of tables, the most important for interpretation are the K-Way, Partial Association, Backward Elimination and Parameter Estimates (Field, 2013: 751-752). The K1 line in the first part of the K-Way table shows the effect of removing all one way effects and any higher order interactions on the model, K2 the effect of removing two way effects and higher, and so on (ibid). The second section tests removal of effects in isolation, without the higher order interactions, and so a significant K2 shows that the removal of at least one two-way interaction has an effect on the model (ibid.). In small samples, the likelihood ratio is to be preferred over the Pearson’s statistic for determining significance (ibid.). The Partial Associations shows which of the interactions are having an effect upon the model, and any interactions at a lower order than indicated as significant in the K-Way can be ignored (ibid.). Finally, the Parameter Estimates also show which interactions have an effect upon the model but can also be used to understand the size of a variables effect on the model, and it gives a confidence level (ibid.). If there is a contradiction between the sections of the K-Way table and/or the Partial Associations, then Parameter Estimates can be used to check the results (Kaushik, 2014).

For log-linear regression each cell in the contingency table must have an expected count greater than one, and no more than 20% should be less than five (Field, 2013: 735). Question
had the most response categories at 11 (not including “Nothing or N/A”), meaning that for this question 42,240 participants would have been required for the log-linear analysis to have an adequate level of statistical power, or 5.2% of visitors to Stonehenge; this experiment collected only 0.095% of this number. The smallest amount required is Question 18 at 7,680. Of course, more participants could have resulted in more response variety, further increasing the sample size requirements. Other than collecting more data, there are three possible responses to such a situation: remove variables, starting with the one which is expected to have the least effect; combine categories within a variable or outcome; or accept the loss of power (ibid.). In order to achieve the requirements with a sample size of 40, it would only be possible to have one or two variables and a set of answers, and so a loss of power will have to be accepted.

The first step that can be taken is to remove “Nothing or N/A” responses, as these will not tell us anything about participants visual perception of the landscape, and there are many possible reasons for such responses, including a lack of time, distractions, question understanding, interest etc. Whilst the Fisher’s Exact Tests can give us some indication about which variables can be removed from the analysis, the possibility of variable interaction must be considered. It is therefore worthwhile running an initial Log-linear regression to determine which variable is the best to be removed.

Appendix 6 contains the contingency tables for each question (the number of participants in each combination of variables and responses), and Appendix 7 contains the log-linear analysis results; once again due to the size of the dataset these appendices are on the accompanying DVD.

The number of variables in the analysis means that SPSS, with its limit of 99 steps, could not complete the Backwards Elimination. The other tables can still offer some insight however. For all of the questions except for Question 10, the K-Way table showed an effect only with one way effects in isolation. Question 10 showed significant two way interactions. Every question had a discrepancy between the ‘K-Way’ and the ‘K-Way and Higher Order Effects’ sections, with the latter showing no significance for removal of every variable on the model. Each question’s Partial Associations correspond to the K-Way section, suggesting that some of the variables are significant, whilst the Parameter Estimates are all non-significant. This
contradiction may be an effect of the small sample size. In order to proceed with the analysis and pick a variable to remove, the Partial Associations may still be of use. For every question, gender was shown to be non-significant, and the use of guide materials was consistently the other least significant demographic variable. Gender was also implicated in affecting only a higher order question in the Fisher’s Exact Test, and can therefore be removed from the log-linear regression. Whilst guide use had a large effect on Question 1 in the Fisher’s Exact Test, it had none on other questions and, as the least significant variable, with multiple two way interactions which are not significant in each question, it is the next best variable to remove. Interestingly, archaeological knowledge, which was not considered significant in any of the previous analyses, was significant in all the Partial Associations. Given the comparative strengths of Fisher’s Exact Tests and Log-linear analysis, this is likely a statistical artefact caused by the low sample size.

In order to further increase statistical power, demographic categories and question responses can be collapsed, where possible. The following changes were made to variables:

<table>
<thead>
<tr>
<th>British Landscape Familiarity</th>
<th>Knowledge of British Archaeology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiar</td>
<td>Undergraduate/Amateur</td>
</tr>
<tr>
<td>Very Familiar</td>
<td>Postgraduate</td>
</tr>
<tr>
<td></td>
<td>Knowledgeable</td>
</tr>
<tr>
<td></td>
<td>Professional</td>
</tr>
</tbody>
</table>

The following changes were made to response categories:

<table>
<thead>
<tr>
<th>Question 1</th>
<th>Question 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>On flat ground</td>
</tr>
<tr>
<td>Medium sized</td>
<td>Orientation relative to Stonehenge</td>
</tr>
<tr>
<td>Big</td>
<td>Close to Stonehenge</td>
</tr>
<tr>
<td></td>
<td>On a ridge and on the horizon</td>
</tr>
<tr>
<td></td>
<td>On a ridge close to trees</td>
</tr>
<tr>
<td></td>
<td>Split into constituent parts</td>
</tr>
</tbody>
</table>
The reasoning behind most of these changes should be relatively clear, or has already been highlighted in the descriptive statistics; the splitting of answers needs to be explained however. These answers add considerably to the number of cells in a contingency table, and only constitute between them a small proportion of answers for each question. For log-linear analysis it is not possible to enter multiple answers against the same participant so these answers warrant combining with other response categories. It is also not possible to interpret
which of the multiple things a participant said were most important. In order to deal with this, dummy participants were created with the same demographic variables as the original participants. For most of the questions their response was given as N/A; as these answers are being excluded from the analysis this will have no bearing on the results. For those questions for which they gave multiple answers they have been given one element of the response for their original entry and another for their duplicate. Such duplication of participants could unduly bias the analysis if there were a particular demographic predisposed to giving multiple answers. As such a Fisher’s Exact Test was run comparing participants according to whether they gave multiple responses. Appendix 8 shows the results of this test, demonstrating that there is no significant difference between the two groups. The collapsed response table and demographic variable crosstabulations can be seen in Appendices 9 and 10.

Collapsing the variables and responses in this way significantly reduces the number of participants required for adequate statistical power in log-linear regression. Question 18, for example, would have required 1,728 participants with the compressed variables.

7.2.3.1 Collapsed Log-linear Regression

Appendix 11 shows the results of the log-linear analysis for each question using the collapsed dataset. The log-linear analysis for the collapsed dataset produced K-Way, Partial Association and Parameter Estimate statistics which were similar to those for the full log-linear analysis. For all questions the Parameter Estimates had \( p \) values which were slightly lower, however none were significant at the 0.05 level. Question 1, Question 4, Question 6, Question 9, Question 10, Question 11 Question 14, Question 17 and Question 18, had differences in their Partial Associations statistics. Question 9, Question 10, Question 11 and Question 12 had differences in the Likelihood Ratio K-Way statistics which affected significance. All other questions had a smaller \( p \) value, but with no changes in significance. With the reduced number of demographic variables it was possible to complete the Backwards Elimination.

**Question 1) What do you notice about the sizes of the Cursus Barrows?** - The Partial Associations for Knowledge of British Archaeology and Question 1 became non-significant in the collapsed data log-linear regression. Backwards Elimination showed Age, Cultural Background and Knowledge of British Archaeology*British Landscape Familiarity to be
significant predictors for the model, however “Q1” (the question responses) and all of its interactions with other variables were removed, indicating that an individual’s responses were not a significant predictor for the distribution of data. As an outcome rather than a demographic variable, this suggests that size perception is not affected by any of the demographic variables.

**Question 2)** What do you notice about the location of the King Barrows? - Backwards Elimination showed Age, Cultural Background and Question 2 to be significant predictors for the model at the 0.01 level, and Knowledge of British Archaeology*British Landscape Familiarity at 0.05. This indicates that these variables have an effect upon the perception of a feature’s relationship to its local topography and the horizon.

**Question 3)** If you can, describe the distribution of the King Barrows - Backwards Elimination showed Age, Cultural Background, Question 3 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates that these variables have an effect on the perception of feature distribution and orientation.

**Question 4)** What do you notice about the relationship between the stone uprights and the ditch of Stonehenge? - The Partial Association for Knowledge of British Archaeology became non-significant. Backwards Elimination showed Age, Cultural Background, Question 4 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates that these variables have an effect on the perception of enclosing relationships.

**Question 5)** Describe the relationship between the two barrows to the left of the fence running towards Normanton Down - Backwards Elimination showed Age, Cultural Background, Question 5 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates that these variables have an effect on the perception of the relative position of features.

**Question 6)** Describe the horizon around Stonehenge - Partial Associations showed that Knowledge of British Archaeology was no longer significant, but that Question 6 was now significant. Backwards Elimination showed Age, Cultural Background, Question 6 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors.
for the model at the 0.01 level. This indicates that these variables have an effect on the perception of the horizon, whilst archaeological knowledge on its own may not.

**Question 7) What do you think is the highest point in the landscape?** - Backwards Elimination showed Age, Question 7, Knowledge of British Archaeology*British Landscape Familiarity and Cultural Background*British Landscape Familiarity to be significant predictors for the model. This indicates that these variables have an effect on the perception of relative height.

**Question 8) Describe the relationship of the road to the landscape** - Backwards Elimination showed Age, Cultural Background and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 Level. Question 8 was significant at the 0.05 level. This indicates these variables have an effect on the perception of topographic relationships/bisection.

**Question 9) Describe the terrain of the landscape** - The K-way table had a reduction in the $p$ value at K2, bringing it within the 0.05 significance level. Partial Associations showed that Knowledge of British Archaeology*British Landscape Familiarity, Knowledge of British Archaeology*Question 9 and British Landscape Familiarity*Question 9 were significant, whilst Knowledge of British Archaeology alone was no longer significant. Backwards Elimination showed Age, Question 9, Knowledge of British Archaeology*British Landscape Familiarity and Cultural Background*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates that these variables have an effect on the perception of landscape topography.

**Question 10) The Cursus Barrows are...** - The K-way table had an increase in the $p$ value at K2, removing it from the 0.05 significance level. Partial Associations showed that Knowledge of British Archaeology was no longer significant. Despite the K-way statistics, Backwards Elimination showed Age*Knowledge of British Archaeology*Question 10 and Cultural Background*British Landscape Familiarity to be significant predictors for the model at the 0.05 level and Knowledge of British Archaeology*British Landscape Familiarity at the 0.01 level. This indicates that these variables have an effect upon shape perception.
**Question 11** Describe the role of the Cursus in the landscape - The K-way table had a reduction in the $p$ value at K2, bringing it within the 0.05 significance level. Partial Associations showed that Knowledge of British Archaeology*British Landscape Familiarity, British Landscape Familiarity*Question 11 were significant, whilst Question 11 alone was no longer significant.

Backwards Elimination showed Age and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level, and Cultural Background*British Landscape Familiarity and British Landscape Familiarity*Question 11 at the 0.05 level. This indicates that these variables have an effect on the higher order interpretation of the Cursus.

**Question 12** The King Barrows... - The K-way table had a reduction in the $p$ value at K2, bringing it within the 0.05 significance level. Partial Associations showed that Knowledge of British Archaeology*British Landscape Familiarity and Age*Question 12 were significant.

Backwards Elimination showed Knowledge of British Archaeology*British Landscape Familiarity to be a significant predictor for the model at the 0.01 level, and Cultural Background*British Landscape Familiarity and British Landscape Familiarity*Question 12 and Age*Question 12 at the 0.05 level. This indicates that these variables have an effect on perception of features’ relationship with the horizon.

**Question 13** The Normanton Down Barrows are... - The K-way table had a reduction in the $p$ value at K2, bringing it within the 0.01 significance level. Partial Associations showed that Knowledge of British Archaeology*British Landscape Familiarity and Age*Question 13 were significant.

Backwards Elimination showed Age, Cultural Background, Knowledge of British Archaeology*British Landscape Familiarity and British Landscape Familiarity*Question 13 to be significant predictors for the model at the 0.01 level. This indicates these variables have an effect on perception of features’ relationship to local topography

**Question 14** Describe the relationship between the two barrows to the left of the fence running towards Normanton Down - Partial Associations showed that Knowledge of British
Archaeology was no longer significant. Backwards Elimination showed Age, Cultural Background, Question 14 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates that these variables have an effect on the perception of the relative position of features.

**Question 15) Describe the distribution of the Normanton Down Barrows**- Partial Associations showed that Knowledge of British Archaeology was no longer significant. Backwards Elimination showed Age, Cultural Background, Question 15 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates that these variables have an effect on the perception of feature distribution and orientation.

**Question 16) What do you notice about the relationship between the stone uprights and the ditch of Stonehenge**?- Partial Associations showed that Knowledge of British Archaeology was no longer significant. Backwards Elimination showed Age, Cultural Background, Question 16 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level. This indicates these variables have an effect on the perception of enclosing relationships.

**Question 17) Describe the horizon around Stonehenge**- Partial Associations showed a reduction in the significance of Knowledge of British Archaeology though it was still significant at the 0.05 level. Backwards Elimination showed Age and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level, and Question 17 and Cultural Background*British Landscape Familiarity at the 0.05 level. This indicates these variables have an effect on the perception of the horizon.

**Question 18) Which is the closest to Stonehenge, Normanton Down or Cursus barrows**?- Partial Associations showed a reduction in the significance of Knowledge of British Archaeology, though it was still significant at the 0.05 level. Backwards Elimination showed Age, Question 18 and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level, and Cultural Background*British Landscape Familiarity at the 0.05 level. This indicates these variables have an effect on the perception of distance.
Question 19) Describe the distribution of the ancient man made things in the landscape-
Backwards Elimination showed Age and Knowledge of British Archaeology*British Landscape Familiarity to be significant predictors for the model at the 0.01 level, and Age and Cultural Background*British Landscape Familiarity at the 0.05 level. This indicates that these variables have an effect on the perception of wide scale distribution.

7.2.4 Collapsed Fisher’s Exact Test

Having collapsed the dataset for the log-linear analysis, the Fisher’s Exact Tests were also rerun (Appendix 12), to see if any differences emerged in the results. Whilst the exact results varied, the results were broadly the same. The only notable differences were:

- Cultural Background was no longer significant for Question 1 (What do you notice about the sizes of the Cursus Barrows?) having previously been so at \( p=0.09 \). It is only just outside significance however at 0.056, and has similar Cramer’s V statistics
- Cultural Background is now significant for Question 2 (What do you notice about the location of the King Barrows?) at \( p=0.007 \), having been at \( p=0.151 \). It has a medium effect size at 0.435 but just \( p=0.213 \) for its Cramer’s V statistics
- Cultural Background is now significant for Question 5 (Describe the relationship between the two barrows to the left of the fence running towards Normanton Down) at \( p=0.019 \) having been at \( p=0.143 \). It has a medium effect size at 0.447 but just \( p=0.266 \) for its Cramer’s V statistics
- Familiarity with British Landscapes is now close to significance for Question 11 (Describe the role of the Cursus in the landscape) at \( p=0.052 \) having been at \( p=0.218 \). It has a medium effect size at 0.389 but just \( p=0.133 \) for its Cramer’s V statistics
- Familiarity with British Landscapes is now significant for Question 15 (Describe the distribution of the Normanton Down Barrows) at \( p=0.031 \) having been at \( p=0.064 \). It has a medium effect size at 0.437 at \( p=0.088 \) for its Cramer’s V statistics

7.3 Experimental Findings

The Fisher’s Exact Tests have shown that perception of features’ relationship to horizons may be affected by landscape familiarity and age, each with a medium effect size, though the latter
may be an artefact of the sample size/distribution. Features’ relationships to the local topography may also be affected by landscape familiarity with a medium effect size, though there is a contrast between significance levels for Question 13 and Question 2. Landscape familiarity may also affect perception of local distribution/grouping with a medium effect size, however, again there is a contrast, between Question 15 and Question 3. These latter two spatial relationships probably do not have a significant association with landscape familiarity. Landscape familiarity and age were also significant across all questions in the Partial Associations and Backwards Elimination.

The response to Question 1 was affected by whether participants used guide materials with a large effect size, this is likely because the freely available map gives direct information on sizes. Guide use was significant within the original Partial Association statistics for all questions, but the least significant, besides gender. Gender had a medium effect on responses to Question 11; as a question looking at higher order concepts as opposed to the basics of visual perception this is an interesting result. The Partial Associations however, showed it to be non-significant in all cases.

According to the Fisher’s Exact Tests, archaeological knowledge seems to have no significant effect upon responses, which is an unexpected result. It may be that the small number of knowledgeable respondents is preventing an association from being detected. The Partial Association statistics further reinforce that perception of size, enclosure, wide scale topographic conditions and shape are not affected by archaeological knowledge, whilst suggesting that the perception of features’ relationship to topography and the horizon, bisection, height, distance and wide scale distribution are. For perception of the horizon, relative positioning and distribution/orientation, there is a contrasting picture. In the Backwards Elimination, archaeological knowledge was only significant when interacting with landscape familiarity, or in one instance (Question 10), age. A look at the distribution of Knowledge of British Archaeology and Familiarity with British Landscapes reveals a trend which can explain this discrepancy; as knowledge of British archaeology increases the likelihood of being familiar with British landscapes increases too. This relationship does not exist in the other direction, i.e. increased landscape familiarity does not mean an increase in archaeological knowledge. Given that both variables relate to Britain it is not entirely
surprising that they are not completely disassociated. It would be possible for non-British people to have some familiarity with British archaeology but not have visited the country much, however given the small sample size this has not been manifested. As such, it is likely that it is familiarity with British landscapes, which is in fact the significant factor when this two way interaction appears. The small sample size has also resulted in an association between cultural background and landscape familiarity, though this is not as strong, which ought to be less of an issue in a wider sample.

The Fisher’s Exact Tests suggest that cultural background has a large effect on the perception of feature distribution/orientation, although significance levels for Question 3 and Question 15 do contradict each other somewhat, bringing the former into question. Perception of distance, size, relative position, topographic relationships and relation to the horizon and other landscape features may also be affected, however the contrasting Fisher’s and Cramer’s V statistics make it unlikely. Cultural background was also significant across all questions in the Partial Associations and Backwards Elimination.

There is then no demographic variable which has an effect across all aspects of visuo-spatial perception, when considered in isolation, and even some of those areas which are affected can have differing results depending on how one asks participants. When the variables are considered together in the log-linear regression, there are contrasting results. Backwards Elimination has relatively consistent results across the different aspects of visuo-spatial perception, with age, cultural background and landscape familiarity all significant, Partial Associations suggest that everything but gender and occasionally archaeological knowledge are significant and the Parameter Estimates suggest that no variables are significant.

Given the low statistical power of the log-linear regression, even with the collapsed dataset, it is unsurprising that the results are somewhat contradictory. Whilst the Backwards Elimination was useful in understanding the dataset and the links between Familiarity with British Landscapes and both Knowledge of British Archaeology and Cultural Background, the significance of particular variables for question responses cannot be relied upon. Fisher’s Exact Test meanwhile was designed for use in small samples, where other Chi-square tests would not have enough statistical power. As such, the results of the Fisher’s Exact Test are
those which should be considered as the findings of this experiment. Therefore we can conclude that:

- Guide use has little impact upon responses, except for Question 1 where the map seems to have had an effect upon participants responses
- Gender may have an effect upon the pick-up of higher order relationships/affordances
- Knowledge of British Archaeology had no effect upon one’s visual perception of the landscape
- Age may have an effect upon visual perception of features’ relation to the horizon, though this is not certain
- Familiarity with British Landscapes may have an effect on visual perception of features’ relation to topography and the horizon, though this was only manifest in the multiple choice questions
- Cultural background may affect visual perception of feature distribution/orientation

The results of this experiment and their implications for the aims and objectives of this thesis will be further discussed in Chapter 8. The methodology used will also be reviewed and suggestions made for future work to clear up any uncertainties with this analysis.
8 Discussion

8.1 Discussion of Experiment Results

As discussed in Chapter 7, only a fraction of the necessary responses required for a statistically valid analysis were achieved, as such, the results of the experiment cannot be relied upon too heavily. Whilst Fisher’s Exact Test was designed for use on low sample sizes, at best the results can be considered provisional as the number of participants was so far below what would be expected for a factorial design. With this in mind, the results must be assessed to try to determine the extent to which visual perception of the landscape varies in modern populations.

In general, the responses to the open ended questions were not as varied as might be expected, especially when overlapping responses are considered. Questions 2, 6, 8 and 11 are the only examples of very varied responses. All the questions have outliers, but there tends to be clustering in just a few answer categories, some of which could potentially mean the same or similar things. In general, there is a broad level of consistency in responses, with 11 of the 19 questions having over 60% of responses corresponding to each other. This increases to 12 if “Nothing or N/A” responses are excluded. Given this high level of correspondence in answers, it is not a surprise to find that the demographic variables did not have an impact for the majority of the questions. Gender may have an effect upon higher order relationships/affordances, age and familiarity with British landscapes may affect visual perception of features’ relationships to the horizon; Familiarity with British landscapes may also have an effect upon perception of the horizon, and cultural background may affect the perception of feature distribution/orientation.

The effect of age is not certain, their being a discrepancy between Questions 2 and 12, however, such a result is not implausible given existing research upon the effect of age on mental activity (Berg et al., 1982; Devlin and Wilson, 2010). The finding that determining higher order spatial relationships varies between genders is in line with research on gender differences (Johnson and Bouchard, 2007; Maeda and Yoon, 2013). However, it would seem that basic visual perception of the landscape does not vary between genders. The finding that landscape familiarity has an effect, is not unexpected, however it did not affect some
factors which one might expect it to; such as perception of landscape-wide topographic conditions (Question 9). Given that its effects were only present in responses to multiple choice questions, there may be an element of question induced bias (UCL, 1972: 35).

Cultural background, the demographic variable of most interest for this thesis, only had a significant effect upon the visual perception of feature distribution/orientation, but only in relation to the King Barrows (Question 3). Why this should be the case is not clear. Given that it was not significant for Question 15, a very similar question in relation to the Normanton Down Barrows, we might view this as a statistical artefact generated by the low number of participants. Which way this error might lie is not certain, however, given that culture showed no effect upon 18 of the 19 questions, we can assume that the result for Question 3 was a false positive.

Other than for Question 1, for which the map provided upon entry to Stonehenge gives direct clues, the use of guide materials did not have an effect for any questions. The use of guide materials for Question 1 has likely not had an effect upon their visual perception, as the map gives direct information on monument size. Not all spatial relationships in the questionnaire will be visible on the map, although it is interesting that local distribution and enclosure were not affected by the guide materials, even though these spatial relationships are clearly visible on the map. It may be that as Stonehenge is a lot closer, actual perception of it has a greater effect than looking at the map. For local distribution, it may be that participants are not looking closely at the map, or that it is unclear what constitutes a group, as groups are not clearly demarcated. Local topographic relationships, especially in relation to ridges and the positioning of barrows on the horizon, are also mentioned in guide materials, yet there is no significant effect on questions dealing with these subjects.

Surprisingly archaeological knowledge did not have a significant effect either. This may be because it feeds into higher order cognitive functions; as visual perception is prior to higher order processes there may be no opportunity for it to be affected. Instead, any effect of archaeological knowledge will come at the stage of interpretation based upon visual perception.
In terms of visuo-spatial characteristics, size, height and distance perception seems to be relatively consistent, although there may be some discrepancy in sensitivity to minor differences in size. Eyesight may be a factor here, and in the failure of a minority of participants to accurately gauge relative distances and heights. There is a tendency to perceive the horizon as a boundary, but some disagreement between whether it is continuous or interrupted. The presence of features upon the horizon appears to be a commonly recognised characteristic, showing up in responses to questions even where it was not the intention of the question (Question 2). The perception of relative position of features appears to be widely shared too, though there is little apparent notice of occlusion. This is somewhat surprising given that it is a key factor of depth perception (Hudson, 1960; Jahoda and McGurk, 1974; Jones, 1974; Leach, 1975). It may be that although it is a fundamental part of perception it is not something that many people are explicitly aware of, or that other factors were deemed more important.

There may be a strong consensus on the relationship of monuments to local landscape features. Whilst Question 13 focussed on topography and had a strong consensus, the responses to Question 2 were quite varied. Again, for Question 2, other factors may have been considered more important than topography. Questions concerning the distribution of barrows received quite varying responses, though the majority of them were not mutually exclusive. The answers selected may therefore be based upon what was considered most important, but it is hard to determine to what extent there is a consensus in perception of distribution.

The perception of the remaining visuo-spatial characteristics, looked at in this experiment, all had a high level of correspondence between participants. These include shape perception, enclosing relationships, position of features relative to the horizon and perception of wider topographic conditions. The latter is particularly interesting given the different levels of landscape familiarity, though a wider sample of participants, familiar with different types of landscapes, may demonstrate otherwise.

Despite some variation in responses, and some uncertainty regarding particular results, this experiment suggests that there is little variation in visual perception of the landscape within the modern population. Some of the variation in responses has been, at the very least,
contributed to by the nature of the questions, and the presence of non-mutually exclusive answers within the open and multiple choice questions further complicates the issue. Some variation is no doubt caused by participants attending to different things; we should not expect everyone to give exactly the same responses to each question, even if demographic variables do not affect visual perception. Once again it must be noted that these results are not certain, due to the small number of responses received.

8.2 Experiment Review

The low participation rate for the experiment should be explained. Given the number of visitors to Stonehenge each year, it should be feasible to achieve enough responses in a short timescale, even with relatively low response rates. This was a significant factor in choosing Stonehenge for the experiment.

Discussions were held with EH about the feasibility of conducting the experiment, the questionnaire content, methods of delivery, time scales and advertising. EH agreed to host the experiment and assist in promoting participation. This was to be done with three posters at key locations around Stonehenge. The experiment was also promoted through social media.

The experiment started in late February 2018, during an extended period of very bad weather; this had a negative impact on visitor numbers and the likelihood of visitors choosing to take part. Due to a lack of responses, a number of visits were undertaken during this initial period to check for problems in the online questionnaires and ensure that mobile phone/ Wi-Fi signal were still strong enough. No problems were detected during these visits, however it was noted that only one poster, at the visitor centre, was advertising the experiment. At further site visits, during busier periods, it was established that advertising visibility had decreased further.

Several discussions were held with EH on how the level of advertising and low response rate could be improved. It was agreed that the data collection period should be extended, however, requests to bring groups of students from the University of Southampton, and to stand at the site or visitor centre advertising the experiment in person, were unfortunately
declined by EH. Before the end of the data collection, all signage advertising the study was removed.

At this point other sites and methods of recruitment/advertising were investigated. Avebury was identified as a potential alternate site, and a number of individuals within the National Trust were contacted, but unfortunately no responses were received. The research was advertised with a number of local archaeological/historical groups, museums, the University of the Third Age (U3A), within the University of Southampton and within Wessex Archaeology. Tour operators were contacted requesting that they advertise the experiment to their clients, and language schools that run trips to Stonehenge were asked if they would encourage students to take part, with the additional benefit for them that it could act as a language exercise. Each of these approaches received positive responses, with multiple museums, archaeological groups and the U3A all offering to advertise to members/visitors, two tour operators offering to advertise, and one language school offering to get their students to take part.

Whilst this may have resulted in a few extra responses, ultimately these attempts were unsuccessful in gaining additional non-British participants. Further, unsuccessful attempts at advertising were made through the University press team, through BBC Wiltshire and through That’s TV. During the experiment, Stonehenge was a major news item, due to the archaeological mitigation being conducted for the A303 tunnel. It was hoped that the public interest in Stonehenge might incentivise BBC Wiltshire to cover the experiment with an article, however no response was received. Having filmed an interview with That’s TV about another subject, they offered to advertise my experiment, however this second interview was ultimately not aired.

Despite all of the actions taken, attempts to significantly boost participant numbers and find alternative solutions where unsuccessful, ultimately resulting in a low response rate to the questionnaire. It is also of note that the recruitment posters topmost language was English, and that all social media advertising was in English. This may help explain the dominance of English participants.
In addition to the low response rate, a number of other factors have also been identified which may have contributed to the uncertainties discussed above. For some of the open-ended questions, participants demonstrated a very broad range of responses, including things other than the initially intended subject. However, this was anticipated, and was the reason for the inclusion of multiple choice questions. If worded differently, some of the questions may have better communicated their intent. However, a number of questions were deliberately vague, in order to avoid leading respondents. Whilst there are additional insights to be gained from a broad range of self-selected responses, this has resulted in answers which are not mutually exclusive. This is problematic for analysis as it is not possible to determine whether different participants actually perceived that aspect of the landscape differently, whether they attended to different elements, or if they simply thought that something was the most pertinent thing to write.

As expected, the multiple choice questions also introduced an element of bias in some cases by suggesting responses to participants and restricting the ways in which they could answer. However, this was not the case for all of the questions as the response categories selected gave candidates multiple plausible answers to limit the bias as much as possible. An unintended consequence of this, was that some of these questions also had non-mutually exclusive answers. This was an oversight, and given the problems of analysing such questions, a greater level of bias may have been preferable as the open ended questions giving the opportunity for flexibility in response.

With the restrictions of a questionnaire approach, it has not been possible to understand the nuances of what participants perceived, to follow up on what they may have meant by an answer, or to clarify a question for them that they did not understand. This has resulted in answers which could not be used, or as already noted, answers which are not mutually exclusive with the responses of other participants. It is assumed responses may have been limited to what the participants thought was most pertinent, rather than everything which they have perceived. Despite this, there has still been a large degree of correspondence. It may be that underneath this there is more variation in the perception of less prominent elements of visuo-spatial relationships. Other than the low number of participants, this one way interaction has been the biggest problem in analysing the data.
As discussed in Chapter 6, the best approach for gaining high quality and accurate data would be cognitive interviewing (Willis, 2005). Using this approach, it would be possible to clarify questions and to ascertain what a participant really meant with an answer. When it came to non-mutually exclusive answers, participants could be further questioned to ensure that the full extent of what they perceived was recorded, instead of relying on multiple choice questions which have an inherent bias. This would still have to be carefully managed, but there is a wide body of literature on cognitive interviewing which could be used to design such a data collection procedure. This approach was not feasible for this thesis, due to the time involved in data collection, however, it may be the best way to collect the data required to understand variation in visual perception of the landscape. The findings of this experiment suggest that it may be acceptable to remove use of guide materials and archaeological knowledge from the variables investigated and thus reduce the number of participants required, making a cognitive interview approach more feasible. However, because of the low statistical power of analyses in this thesis it would be worthwhile including them in future work. A cognitive interview approach would also require a multilingual team in order to allow participants who do not speak English to take part.

The validity of this approach as a methodology of crowdsourced interpretation has not yet been demonstrated. In order to test whether this approach can be used for assessing previous work, or developing new interpretations, a larger number of participants is required. Within the small sample of this experiment, there were no responses which would suggest any new interpretations worth exploring, although the repeated mentioning of trees as important landscape features in Questions 2 and 6 does add credence to the landscape definition discussed in Section 1.3. Variation in response also offers a potential insight into differences in attention, or what characteristics are conceived as most important. Further testing would therefore be required to give a full assessment of the technique of crowdsourced interpretation.

It was hoped that this experiment might increase participant engagement generally, and specifically with the archaeology in the wider landscape, rather than focussing only on Stonehenge. This ties directly back to the Stonehenge research frameworks. As such, it was particularly positive that more than a quarter of participants gave feedback that they enjoyed
taking part in the experiment and that it made them consider the wider landscape much more than they otherwise would have done.

8.3 To What Extent Does Culture Affect Visual Perception (of the Landscape)?

In order to answer the main research question, “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?”, different strands of evidence have been analysed throughout this thesis. This has included perceptual theory, cross-cultural and ecological perceptual experiments and a range of archaeological evidence. These have each been evaluated in turn, and this section will bring them together in an attempt to answer the research question.

Chapters 2 and 3 assessed existing perceptual research, and found that direct theories of visual perception were better supported by experimental evidence. These direct approaches are based on invariable rules regarding change and structure within the environment and often involve little or no mental processing in visual perception. Further to this, certain fundamental elements of perception develop early enough in infants to be considered uninfluenced by cultural or environmental factors (Schwatz, Campos and Baisel, 1973; Walk, 1982; Bornstein, 1990). Environment does not seem to affect perception in adults either (Allport and Pettigrew, 1957; McPhearson, 1965; Ahluwalia, 1978). Only Hudson (1960; 1962a; 1962b; 1970) has explicitly argued for a cultural influence on perception, but serious problems with his work and conflicting results from other studies suggest that this is unlikely (Campbell-Bell, in preparation). The weight of theoretical and experimental evidence suggests that basic elements of visual perception, at least as explored in abstract experiments, occur the same way in all humans. As such, they imply little cross-cultural variation, especially in relation to basic visuo-spatial factors. Colour perception seems to be the one area of visual perception which may be different between groups due to experience (Bornstein, 2006; 2007)

The experimental and theoretical evidence was brought together to formulate the Ecological Motor Theory, which describes perception as a direct, non-inferential, extended process, in which the environment plays a key role in our perception. The lawful way in which the environment responds to interaction, creates a consistent and reliable perceptual process which develops out of self-driven development of sensorimotor knowledge. Perception is the
same across different individuals for basic elements such as shape, position, distance etc. However, that which depends on prior cultural knowledge or on cognition may differ between individuals.

The kinds of interpretations that archaeologists make about landscapes go beyond these basic processes and much of the perceptual research has been carried out on western populations. That which is specifically cross-cultural, has focussed on drawing and illusions rather than real world contexts, and so whilst indicative of the effect of culture upon visual perception, the issue could not be considered resolved.

The analysis of archaeological evidence in Chapter 4 suggested that past people could utilise sensorimotor knowledge to understand the landscape as if viewed from above, and that they both perceived and understood spatial relations well enough to depict them within art. This was not always deployed, but we need not expect it to be, as the aims and skill of different artists will vary. Archaeological evidence also suggests that Gestalt principles, which have been identified as fundamental traits of visual perception in modern populations, may have been present in past people, perhaps even crossing species boundaries. The identification of two possible types of illusion in rock carvings raises the possibility that past peoples’ perceptual systems were subject to some of the same illusions as ours, however, these require a great deal more investigation. Finally, the perception of colour was investigated, and whilst this issue has been looked at by a number of archaeologists, the only research which we can be confident shows that past people perceived colour in a similar way to modern people comes from Baines’ (2007) work in Egypt; other sources of evidence are too ambiguous to confidently interpret. Taken as a whole, the archaeological evidence suggests the possibility of shared perception between modern and past people. Certainly there is nothing which clearly demonstrates that we do not perceive in the same way. This evidence does not directly apply to the perception of landscapes, and landscape evidence was not discussed. This is because it is difficult to research past peoples’ perception of landscape without reverting to the existing landscape archaeology approaches which this thesis is investigating the validity of.

The landscape based perceptual experiment was carried out in order to directly address visual perception of the landscape and the results support the findings of Chapters 2 and 3.
Whilst there was undeniably variation within responses, as would be expected, there does not appear to be a cultural influence upon visual perception of the landscape. The number of responses bring into question the validity of the statistical analysis, however, the findings are in support of existing perceptual research. It would therefore seem that, in a modern context at least, cultural background does not affect visual perception of the landscape.

As argued in Chapter 5, with the principle of Perceptual Uniformitarianism, if culture does not affect visual perception of the landscape in a modern context, then there is no reason to assume that culture would have an effect in relation to past cultures. The process of culture having any affect upon perception should remain constant regardless of time or place.

As the evidence discussed in this thesis suggests that, in a modern context, culture does not affect visual perception of the landscape, and given that there is no archaeological perceptual evidence which clearly contradicts such a finding, we can suppose that culture did not affect visual perception of the landscape in the past. However, attention should not be forgotten, as it can affect perception; this has been raised both in theoretical work on visual perception, previous experiments and the experiment conducted for this thesis. Bearing this in mind, however, we can argue that the core process of visual perception of the landscape is comparable between past and modern people. Therefore, we can suppose that there are no significant differences in visuo-spatial perception between people of modern and past cultures in a landscape context.

8.4 Implications for Archaeological Site Presentation

Chapter 1 discussed the importance of the public being able to engage with archaeological presentations of the past, and how archaeologists have a duty to insure that this happens (Mckercher and du Cros, 2002; Liwieratos, 2009; Chan, 2017). In order to facilitate this, it is important that we understand the public that we wish to engage (Merriman, 1999b). The potential for differences in perception between groups has been recognised, not only in interpretive archaeology and perceptual research, but also work on site and museum presentation (Owen, 1999; Sørensen, 1999; Hooper, 2000; Alpin, 2002; Okpoko and Okonkw, 2005). Just as archaeologists could not accurately interpret landscape evidence if their visual perception was significantly different from those of the people they are studying, if people
being presented that interpretation perceive in a significantly different way, they would not be able to fully engage with or understand that presentation.

A key aspect of understanding the archaeological audience for landscapes is therefore their visuo-spatial perception of those landscapes. This thesis has suggested that culture, and indeed age, gender and archaeological knowledge, do not affect visual perception of the landscape, whilst landscape familiarity was found to be significant for some elements. Whilst not directly linked to other demographic variables, there will be a strong trend towards foreign visitors to any site to be less familiar with the landscape than inhabitants. For major international sites, such as Stonehenge, this could cause some issues for site presentation. However, this effect was only manifest in multiple choice questions, and not the matched open-ended questions. Whilst unlikely to be an issue, this factor would warrant further investigation, given the prevalence of international heritage tourism (McKerher and du Cros, 2002). There is then, potential variation in visual perception of the landscape, as reported by participants, but this is smaller than might be expected, and in most cases does not seem to be driven by any of the demographic factors analysed.

James (1999) raised the prospect of problems in using pictures in site presentation, due to potential differences in their perception. A review of relevant literature in Chapter 3 demonstrated that picture perception is not affected by cultural background, and whilst there are some studies supporting variables such as education being a factor in their perception, the majority of studies suggest otherwise (Jahoda and McGurk, 1974; Jones, 1974; Leach, 1975). This means that pictures can confidently be used as part of a suite of presentation techniques.

The finding that archaeological knowledge does not affect visual perception of the landscape is of particular note for site presentation. Whilst this means that visitors should be able to identify and understand visuo-spatial relations and features which form part of the presentation, this does not mean that those creating guide materials have licence to include highly complex information. Firstly, this finding is based purely upon the landscape perception experiment, rather than a wider body of evidence, and as the statistical power of this experiment is restricted by the number of participants, we cannot take this as a definite finding. Secondly, even if this result is correct, the application of archaeological knowledge is
likely a higher order mental process. As such, we might expect it not to affect perception, but the comprehension of a presentation, beyond the basic perceptual requirements, will very much depend upon one’s ability to apply knowledge to the content of that presentation. Therefore, if information about a site is pitched at too high a level, those without the requisite archaeological background will not be able to fully engage.

With use of guide materials only affecting responses to Question 1, one might ask how much of an effect presentation really has at archaeological sites. Duke (2007: 61), and Hughes et al. (2013: 76) suggest that visitors almost never fully engage with heritage sites; are the findings of this experiment support for such a view? Had the experiment found other demographic driven differences in visual perception, it would be possible to assert that the guide materials failed to engage participants in the right way, however this was not the case. A complete lack of engagement cannot be the cause, as participants identified themselves as having made use of the guide materials during their visit. There are two potential causes for a lack of effect here, the first being that the visual perception of participants was broadly the same as each other, and those who interpreted the landscape and wrote the guides. The second is that, like applying archaeological knowledge, reading and ingesting information is a higher order cognitive process. The perceptual experiment and literature review would suggest that both may be a factor.

The findings of this thesis lead to the conclusion that variation in visual perception of the landscape is not a major concern for archaeological presentation. Nonetheless, this does not mean that this presentation does not have challenges to face. Attention, or recognition of the relevance of certain features, have been identified as possibly contributing to the variation in responses observed in the experiment. There is therefore still the potential for perceptual variation, however, this might be managed through careful direction of audience attention and an assertion of a feature/characteristics importance.

The only question pertaining directly to higher order spatial relationships showed gender had a significant effect on responses. Given that the application of archaeological knowledge and the use of guide materials may be higher order processes, there is the distinct possibility that gender may affect how one responds to site presentation. This is not a directly perceptual issue, but would benefit from further study in order to better understand the extent of any
effect, and how it might need to be responded to within site presentation practice. Again this comes only from the perceptual experiment, and in this case only one question, and so more focussed study may have differing results.

Different groups within the public also still have varying needs, and desire different things from visits to sites (James, 1999; Mckercher and du Cros, 2002; Kaufman, 2004; Skeates, 2017), which should be addressed. There are two fundamental requirements for engagement; having the ability to engage, and the desire to engage. We can be confident that archaeological presentation will allow the former, regardless of audience demographics. In order to encourage the latter, presentation must deliver what is relevant and interesting to the audience; it must respond to their higher order needs. This may require an approach that is tailored to specific groups, though here too there are challenges.

Whilst different groups have different needs and interests, we must be careful not to simply reflect these groups history back at them. Just as western white people are interested in a diverse range of history, so too can other ethnic or minority groups be. This is evidenced by the large diversity of visitors to sites such as Stonehenge from around the world. Therefore, whilst presenting heritage in such a way as to interest diverse groups, we should not limit what they can engage with; the perceptual evidence suggests that we all have an equal capacity to perceive characteristics of heritage, and thus engage with it.

If these demands can be met, as much work in museum studies has been driving towards (Merriman, 1999a; 1999b; Kaufman, 2004; Crooke, 2007; National Audit Office, 2009; Rahim and Navra, 2013; Historic England, 2017; Labadi, 2018; Phillips, 2018), then it will be possible to create greater engagement with heritage amongst an increasingly diverse public. This will ensure that the public benefit (Blac, 2005; Historic England, 2017), heritage jobs and the management of sites (Mckercher and du Cros, 2004; Carver, 2004; Frodsham, 2004; Heritage Lottery Fund, 2010) will remain secure, and help avoid conflict, creating increased societal cohesion (Roberts, 1997; Howard, 2003; Carver, 2004; del la Tore, 2005; Crooke, 2007; Heritage Lottery Fund, 2010; Wallace and Hannam, 2013; Car-Locke and Nicholas, 2017).
8.5 Implications for Archaeological Interpretation and Cultural Resource Management

The first part of this thesis established the importance of investigating the potential for cultural variation in visual perception in order to solve an epistemological problem in landscape archaeology. A significant part of data collection in landscape archaeology is based upon visual perception, and so the validity of the data collected is under question if that perception is dependent upon one’s cultural background. As was explored in Chapter 5, we cannot begin to understand how past people used and thought about their landscapes unless the data from which our interpretations start is the same as the data they perceived. Whilst the potential problem of cultural variation in visual perception has been raised many times, primarily in relation to archaeological interpretation (see Chapter 1), there has been a lack of extended critical engagement with perceptual research. Following from the views of Abadía (2017), Lucas (2015) and Shillito (2017) regarding the advancement of archaeological knowledge, addressing this has been one of the key aims of this thesis.

The perceptual evidence in this thesis suggests that various demographics do not significantly affect visual perception of the landscape in a modern context. Chapter 4 demonstrated a number of potential perceptual similarities between modern people and a range of past people. Combined with the principle of Perceptual Uniformitarianism, the evidence has been used to argue that there is not a significant difference in visuo-spatial perception between past and modern people. If this is the case, then visuo-spatial approaches, which have been the primary method of investigation within landscape archaeology since its inception, can be considered as valid. The visual perception of landscape archaeologists is likely similar to that of past people, meaning that they are at least capable of collecting the right data from which to build archaeological hypotheses. As with site presentation, we cannot take this as license to say anything we want, or to assume that any hypothesis is correct. There are still issues of attention (Michaels and Carello, 1981: 69; Michotte, 1991: 65) to be considered in the data collection, and following this, higher order processes such as the application of cultural and archaeological knowledge, contextual evidence and critical reasoning come into play. As demonstrated in the perceptual experiment, these higher order cognitive processes may be affected by demographic variables, such as gender.
Through the application of perceptual research, it is now possible to argue that researchers such as Shanks and Tilley (1992), Bender (1993) Hirsh (1995), Thomas (1996; 2012; 2015a), Kealhofer (1999) Smith and Blundell (2004), Eve (2014) and Springs (2015) were mistaken with regards to the effect of culture and, in this case, the limits of archaeological interpretation. Instead, Cognitive archaeologists who asserted that there is no reason to assume mental differences between past and modern people (Renfrew, 1994) seem to be correct. Whilst there are still problems with Phenomenology as a perceptual theory and an archaeological methodology, it is of note that the “prereflective embodied consciousness” which Tilley (2004: 31) argued for fits with Ecological Motor Theory. Therefore, the underlying perceptual principles of phenomenology seem to be valid.

An additional insight offered by the perceptual landscape experiment for archaeological interpretation is the importance of horizons. Whilst the idea of features being framed by the sky on the horizon, or false crests, is a common idea in archaeological literature, and seems to be corroborated within this experiment, it was interesting to see how the horizon itself was perceived. For Question 17, 53% of responses described the horizon as a boundary, no doubt due to the fact that it occludes sight of anything beyond it. If the horizon is a boundary we could conceivably argue that it acts as a perceptual edge to the landscape. Whilst the horizon will shift with a person, in some landscapes it will remain relatively consistent across most points within it, with only particularly high points and points on which what was previously perceived as the horizon offering a different view. This broadly consistent visual envelope might be one practical, embodied way, of defining the edges of any such landscape; this could be done through site visits or viewshed analysis.

If Ecological Motor Theory, or any of the extended theories of perception/cognition are correct, a number of different avenues for research are opened up. The potential for neurological changes based upon action, or the modification of an individual’s capacity or approach to cognition, due to changes to their environment, have serious implications for archaeological research (see Chapter 2). The emergence of tool use, and its subsequent effect on cognition, is an obvious area of interest, as is the effect of increasing landscape modification from the Mesolithic onwards. Was this modification triggered by a change in cognition? Or, did small scale modification of landscapes create cognitive changes which led
to further modifications, creating a feedback loop that ultimately dramatically changed the landscape? Might landscape modification and interactions with those modifications be as much about thought as action? These are all interesting potential avenues for archaeological research, highlighted by the application of perceptual research within this thesis.

The discussion of perceptual research has also raised affordances as a potentially powerful tool for archaeologists seeking to interpret landscapes, architecture and material culture. As directly perceived emergent properties (Stoffregen, 2003), the applicability of which can be understood across individuals, affordances offer the possibility of investigating how archaeological remains may have been utilised in the past. Whilst Ecological theorists present a number of various conceptions, some of which imply the possibility of cultural variation in the perception of affordances (Witt and Riley, 2001; Michaels, 2003; Kirlik, 2004), this thesis has distinguished between lower and higher order affordances. This distinction may also help archaeologists to determine what visuo-spatial relationships are being directly perceived, and what relationships have increasing cognitive aspects in their interpretation. Objects, buildings or landscape features for which an understanding of their use depends upon culturally constituted knowledge, can be said to have higher order affordances. However, it has been argued that these are built upon a series of lower order affordances which lie upon a continuum of increasing specificity, dependent upon increasing levels of knowledge, or combinations of an increasing number of other affordances and properties of the animal-environment system. Certain things, such as chairs or caves have directly perceivable lower order affordances, even if they are also laden with extra meaning. Some of this extra meaning can be discerned through a careful analysis of affordances, especially given knowledge available from other sources; ultimately, qualities are perceived before meaning.

A stadium or theatre has been presented as a good example of how something can have very basic affordances, directly related to an individual’s possibility for action (sitting), increasingly complex, but still not culturally constituted affordances (attention being directed to a particular area), and affordances which require knowledge of cultural context (playing a particular sport). Structuring arguments in relation to affordances in this way may allow for additional insights to be gained, and for the logical steps of an argument to be more explicitly laid out; ultimately allowing for easier critique and refinement of hypotheses. Some culturally
constituted affordances will be so complex and abstract, that without very specific knowledge, there is no guarantee that we will ever be able to know precisely what some things were used for. However, affordances will allow us to investigate their possibility space.

Chapter 1 also discussed how the potential for cultural differences in visual perception may lead to complications for cultural resource management. If visual perception of a landscape and the visuo-spatial relationships within it varied, then so to would any determinations of significance; certain relationships may be identified by some groups and not by others, leading to different interpretations. There may therefore be differing views on what and how to manage within an archaeological landscape. This is particularly pertinent for instances where the individuals directing the management are from a different culture than those who identify most strongly with the heritage, such as native groups. The effects of this management also tie directly into what is available for the public to experience when they visit such managed sites.

The evidence discussed in this thesis suggests that we need not worry about differences in visual perception affecting the identification of significance and subsequent CRM. As with archaeological interpretation, the data upon which this is based does not seem to vary across cultural divides. CRM can thus be said to have a solid perceptual foundation. Once again, this does not mean that this is a straight forward task. There are still the needs and desires of stakeholder groups to be considered, as well as considerations of resources and priorities. Also, whilst visual perception may be the same, certain aspects of landscapes may be better understood through specific cultural knowledge held by native groups. As identified in the discussion of affordances, higher order cultural knowledge can further refine initial interpretation based upon perceptual evidence. The exact significance, or particular management needs of a feature, may be better understood by those with such knowledge, though again all involved must be aware that native cultures have not remained static.

If sites can be managed in a way which takes account of all of these factors, in light of the perceptually valid underpinnings for such activity, it should have a positive impact on our ability to interpret and present archaeological sites and landscapes.
8.6 Contributions to Perceptual Research

Chapters 2 and 3 of this thesis form a comprehensive review of the major theories of visual perception, and experiments relating to spatial perception and cross-cultural differences in visual perception. This demonstrated that direct theories of perception have greater explanatory value, and that perceptual development is driven by experience. The Enactive Approach (Nõe', 2004), Ecological Perception (Gibson, 1966; 1976; 1986; 2002), Active Externalism (Clark and Chalmers, 1998; Tylén and McGraw, 2014) and the Extended Mind Hypothesis (Malafouris, 2004; 2008; 2010a; Malafouris and Renfrew, 2010b) were combined, making use of evidence from perceptual experiments to suggest a new Ecological Motor Theory of visual perception. This defines visual perception as a direct, non-inferential, extended process, in which the environment plays a key role. This thesis also introduced the ideas of intention, usage and memory retrieval to bolster the concept of extended mind, and to counter arguments by the likes of Adams and Aizawa (2012) and Ludwig (2015).

The review of perceptual research found a lack of detailed analysis of spatial perception, particularly within an ecological setting. This thesis has presented the first experiment looking at the visual perception of space within a landscape context, and whilst it has flaws, has suggested new possibilities for investigating visual perception in a more ecological manner. Evidence from existing work was used to formulate Ecological Motor Theory, and although not specifically designed to test it, the findings of the perceptual landscape experiment are what would be expected were it correct. A number of questions are still to be answered which may further support or bring into question this theory; experiments aimed at resolving these are discussed in Section 8.7.

The perceptual landscape experiment also revealed little apparent notice of occlusion in participants. This is interesting given that it is viewed as a fundamental element of depth perception (Hudson, 1960; Jahoda and McGurk, 1974; Jones, 1974; Leach, 1975). It may be that it was not deemed the most important factor, that people are not explicitly aware of it, or that in real world perception occlusion plays less of a role in depth perception. This, along with other distance cues discussed by Gibson (1986), Seckel and Klarke, and Gregory (both in Illusion Works, 1997) could be further explored outside of a lab setting to gain a better understanding of how depth perception functions.

258
Typically, perceptual research takes place with modern western participants (Henrich et al., 2010). This research has also opened up the possibility of investigating perception over a wider time span using archaeological material, potentially offering insights which may not otherwise be available.

Finally, a detailed discussion of the concept of affordances in Chapter 3 went some way to reconciling the differences between competing views of what an affordance is (Turvey, 1992; Witt and Riley, 2001; Michaels, 2003; Stoffregen, 2003; Kirlik, 2004). This thesis defined affordances as emergent properties, determined by the environment and perceiver, which may be higher or lower order, the former being built upon combinations of the latter, which are directly perceived. This distinction solves many of the disagreements about what counts as an affordance and what an affordance might actually be.

8.7 Where Could Further Evidence be Found?

Whilst a number of conclusions have been drawn from the available evidence, sources of further information have been identified which may be used to resolve ambiguities, and provide greater insight into visual perception in modern and past people.

The first source of new evidence would be a further perceptual landscape experiment, designed to address the methodological problems identified with the one conducted for this thesis. Importantly, it would gather enough evidence to support a factorial design. Another source of evidence, building upon the work of this thesis, would be a more comprehensive study of rock art. Whilst this thesis has given an overview of rock art readily available in the literature which may give clues about past peoples’ perception, a focused study looking at a wider pool of rock art, may offer further insights. There may also be further examples of illusions in the archaeological record, and the possibility of cup and ring marks being used to create an illusion needs to be further explored.

The future development of neuroimaging will also allow perception to be better understood, and embodied cognition to be further explored (Sporn, 2010). Wider studies targeting people from different demographics could offer insights into any potential physiological/neurological differences in perception, rather than relying on psychological experiments.
The importance of self-directed movement for the proper development of visual perception, a key factor in a number of perceptual theories used for the arguments in this thesis, could also be further explored through animal developmental experiments. Experiments in this field by Walk et al. (1978), had potential flaws which would need to be resolved. Held and Hein’s (1963) experiment could also be repeated, in an open environment, establishing whether attention or locomotion is the key element to perceptual development.

Each of these areas will add to the evidence on how visual perception functions and develops, and how it might differ between people, thus further contributing to an understanding of the extent to which we can suppose common visuo-spatial perception between people of modern and past cultures.

8.8 Conclusion

This thesis has brought together archaeological and perceptual evidence in order to answer the question “to what extent can we suppose common visuo-spatial perception between people of modern and past cultures, in a landscape context?” Whilst the findings of the perceptual experiment were not certain, they support wider perceptual research and the archaeological evidence discussed. It was, therefore, concluded that there is little reason to suppose any significant differences between past and modern peoples’ visual perception of the landscape.

All but one of the aims of this thesis, outlined in Section 1.10, have been successfully fulfilled. The final aim, “Discuss the implications of the experiment’s findings for research in the Stonehenge landscape”, was not fulfilled. This was due to the responses to the perceptual experiment not highlighting any new areas of particular interest, and the number of responses being inadequate to give a critical review of existing interpretations. For the same reasons Objective 9A, “Discuss the success of the experiment methodology as a crowdsourced landscape interpretation tool” was not completed. Given that there were no visuo-spatial attributes which were clearly affected by perceptual variation in the experiment, and little in the literature to suggest clear cultural differences, Objective 6C, “Establish a perceptually valid archaeological vocabulary”, was also not completed.
This chapter has outlined the implications of this research for archaeological interpretation, site presentation and cultural resource management. The perceptual underpinnings of each of these appear to be valid, and so any dispute about visuo-spatial approaches to landscape archaeology on these grounds can be dismissed, whilst acknowledging that further studies in the future could conceivably still revise this stance.

There are however still many things which must be considered to ensure good practice, and we cannot just assume that modern people and landscapes are exact proxies for past people, or indeed each other. Whilst visual perception may be the same, higher order cognition will vary between groups and individuals, and we are working with altered landscapes. Improved archaeological evidence will help with the landscapes, for the people, we must be mindful of what we are doing as archaeologists when interpreting, managing or presenting the past.

Those managing and presenting heritage sites need to understand their audiences; the perceptual validity of landscape archaeology does not mean that they can be treated as a uniform group when we are seeking to engage them. The application of archaeological knowledge, gender and attention need to be considered at the very least, especially in relation to more complex spatial relationships and interpretations. If seeking to engage people with a particular element of a site, it must be clearly signposted (both literally and figuratively); the feedback from the perceptual experiment demonstrated how little people would pay attention to the wider landscape at Stonehenge had they not been directed to look out at it by the questionnaire. Whilst Stonehenge is the primary draw, visitors’ experience (and archaeological knowledge) can be greatly enhanced by encouraging them to pay attention to the rest of the landscape. Whilst the guide materials and signage certainly do this to an extent, it is evidentially not enough. Perhaps the general focus as a visit to “Stonehenge” rather than “the Stonehenge landscape” is to blame.

No doubt similar effects can be seen at other major heritage sites, but every site/landscape and every attempt at heritage presentation is different, as no doubt is any site’s visitor profile. To better understand their visitors and what they are best able to engage with at a site (archaeology, methods of presentation etc.), it may be worthwhile conducting a survey of the type used in this thesis. Whilst basic aspects of visuo-spatial perception are probably not needed, given the findings of this thesis, it may be of use to include them, both to ease
participants into the questionnaire, and to act as a way to encourage further engagement generally. Analysis of the data may well reveal that certain elements of the site have different levels of engagement and understanding across different groups; such data could be used to improve site presentation and open up equal access to all. Given the privileged access that heritage managers at these sites have to visitors, this data could even be compiled into a much more comprehensive data set than was achieved here, allowing further confirmation of the perceptual experiment’s findings. Even if the questionnaire data is not analysed to improve engagement, the very act of offering it to visitors to fill in could increase their engagement.

For those engaged in archaeological interpretation, a number of things can be taken from this thesis, beyond the understanding that culture does not appear to have a significant impact upon visuo-spatial perception of landscapes. When it comes to basic spatial attributes and relationships such as shape, position, distance, size etc. one can be confident that this data can be used to build robust interpretations. The same can be said of lower order affordances; if an element of a site clearly affords something, one can be confident that it afforded the same thing for past people. This not only gives some security to interpretations, but also offers a tool for building more complex ones. If we can identify the lower order affordances of a site (object, building or landscape) we can start to build up an understanding of those that are complimentary. At times this may be quite a long and complex process, there are many possible lower order affordances for an object, but a thorough examination of the possibilities, then whittled down through an application of logic and other archaeological evidence can lead us to these complimentary affordances. As with attention, it is better to attend to non-relevant elements than to miss all that is relevant. Having established what these affordances are, one can start to build up a picture of increasingly specific affordances, applying existing archaeological knowledge to build up an interpretation of the use of the site (object, building or landscape). One may never get to the exact function, but affordances at least offer a structured way to work towards and test higher order interpretations of the sort which are of interest to many archaeologists.

Having mentioned attention, it is worth reiterating its importance. A modern archaeologist may very well attend to different aspects of a landscape than the people they are studying.
This is difficult to avoid, but the impact can be minimised by becoming familiar with a study landscape, each time one visits trying to find things which were not noticed on previous visits. As with affordances, building up a picture of what it is possible to attend to, and then refining it with archaeological evidence may give researchers greater confidence in their interpretations, avoiding the kind of seemingly contradictory statements sometimes seen in the literature.

Beyond answering the research question, offering the above suggestions for practice and representing the first piece of work to critically engage with the full range of perceptual research within landscape archaeology, this thesis has made a number of contributions to research. These include:

- A critical review of perceptual theories and experiments
- Synthesis of this research into an Ecological Motor Theory
- The concept of higher and lower order affordances
- The first ecological perceptual experiment into spatial perception
- Outlining multiple new experiments to gain further insight into perception
- The concept of crowdsourced interpretation
- The principle of Perceptual Uniformitarianism
- A new approach to looking at ancient art
- Outlining new avenues for archaeological research based upon insights from perceptual research
A Cultural Analysis of Landscape Perception

Please complete this questionnaire in accordance with the instructions contained within and the briefing talk given.

Damien Campbell-Bell
Faculty of Humanities
Department of Archaeology

E-mail: dacb106@soton.ac.uk
Section A. Demographic Information

Question A1.
What is your age?  

Question A2.
Gender (Please tick one box)
Male  
Female  

Question A3.
Please describe your cultural background (the culture in which you were raised/the culture of your immediate family). This may be a singular description (e.g. British, Arabic) or a mixed description (e.g. German-British, Chinese-American etc.)

Question A4.
How many years have you lived in Britain (including years in which only term time was spent in the country)?  

Question A5.
On the scale below please tick the box which you feel best represents your level of archaeological knowledge.

1. None/Very little  
2. Some general knowledge  
3. Student/Amateur  
4. Final year student  
5. Postgraduate  
6. Professional

Please turn over for the next section of the questionnaire
Section B. Bokerley Dyke

Please answer each question with a few brief sentences. Please note that there are no incorrect answers, and questions do not necessarily indicate that there is anything of importance to be commented upon.

Question B1.
What effect does Bokerley Dyke have on your view of the landscape as you enter the nature reserve?

Question B2.
What do you notice about the topography as you follow the course of the Dyke?

Question B3.
What do you notice about the construction of the firing banks?

Question B4.
Bokerley Dyke has been interpreted as a defensive structure. What do you notice about its placement in the landscape?

Question B5.
Is there anything of interest about the horizons in this landscape?

Question B6.
What do you notice about the positioning of the Dorset Cursus?
Section B. Bokerley Dyke

Question B7.
What do you notice about the 5 barrows (2 long barrows and 3 round barrows) to the South of the Dorset Cursus?

Question B8.
Describe the location of these barrows in relation to the surrounding topography.

Question B9.
Describe the surrounding topography and location of the single long barrow to the South of those referred to in Questions B7 and B8.

Question B10.
Describe the course of the Bokerley Dyke across the landscape.

Question B11.
In your opinion, what is the dominant feature of the landscape?

Please turn over for the next section of the questionnaire
Section C. Bokerley Dyke Multiple Choice Questions

Please answer each question by ticking the box which best matches your opinion. Please note that there are no incorrect answers, and questions do not necessarily indicate that there is anything of importance to be commented upon. Ensure you have finished the previous section before starting this one, and do not go back to change your answers.

Question C1.
The barrows to the South of the Dorset Cursus are...
- Clustered in a group
- Clustered in two groups
- Not in groups
- Have no relations to each other
- On the same alignment

Question C2.
In what way are these barrows related to the surrounding topography? They are...
- On the side of a hill
- On a crest
- On a plateau
- In a valley
- There is nothing of note
- Other (Please specify below)

Question C3.
Barrows are sometimes said to be situated on false crests. This is where the true top of a hill is hidden, from certain viewpoint by a crest further down the slope. The long barrow to the south of those in Questions C1 and C2 is on a false crest. Do you...
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Question C4.
The horizon to the South is...
- Defined by the highest point in the landscape
- In line with the dyke
- Hidden
- Highlighting the barrows
- None of the above

Question C5.
The Dorset Cursus runs perpendicular to Bokerley Dyke. Do you...
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Version 1.0 23/04/2011
Section C. Bokerley Dyke Multiple Choice Questions

Question C6.
The firing banks are built to keep a level platform. Do you...
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Question C7.
The firing banks lie perpendicular to the slope on which they were built. Do you...
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Question C8.
The topography rose as you first followed the Dyke. Do you...
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Question C9.
As you enter the reserve, does Bokerley Dyke...
- Hide the horizon
- Hide the nearby topography
- Follow the horizon
- Follow the topography
- None of the above

Question C10.
Which of the following is the most prominent feature of the landscape?
- Bokerley Dyke
- The Southern ridge
- The barrows
- The plateau
- The Dorset Cursus
- Other (Please specify below)

Please turn over for the next section of the questionnaire.
Section D. Down Farm

Please answer each question with a few brief sentences. Please note that there are no incorrect answers, and questions do not necessarily indicate that there is anything of importance to be commented upon.

Question D1.
Briefly describe the landscape as a whole.

Question D2.
Describe the topography around the henges.

Question D3.
A number of barrows are situated just to the North of the henges, describe the topography around them.

Question D4.
Is there anything of interest about the positioning of the farthest West of these barrows?

Question D5.
There are a number of barrows in the field to the North of the henges. These barrows...
Section D. Down Farm

Question D6.
Do you notice anything about the henges, either as a group or individually?


Question D7.
Describe the position of the road within the landscape.


Question D8.
Describe the positioning of the archaeology within the landscape.


Question D9.
In your opinion, what is the most prominent feature within the landscape?


Please turn over for the next section of the questionnaire
Section E. Down Farm Multiple Choice Questions

Please answer each question by ticking the box which best matches your opinion. Please note that there are no incorrect answers, and questions do not necessarily indicate that there is anything of importance to be commented upon. Ensure you have finished the previous section before starting this one, and do not go back to change your answers.

Question E1.
The henges are placed...
To relate to the barrows
On flat ground
To relate to the Dorset Cursus
On a slope
Other (Please specify below)

Question E2.
The topography around henges...
Is flat
Slopes to the South
Slopes to the North
Is uneven
Other (Please specify below)

Question E3.
The barrows in the field to the North of the henges are...
In a group
In a line
In two groups
Not related to each other
Other (Please specify below)

Question E4.
The most Westerly of the barrows referred to in Question E3 is...
Framed by the horizon
On flat ground
Surrounded by other barrows
Orientated on the henges
Other (Please specify below)

Question E5.
Barrows are sometimes said to be situated on false crests. This is where the true top of a hill is hidden, from certain view points by a crest further down the slope. The round barrow referred to in Question E4 is on a false crest. Do you...
Strongly disagree
Disagree
Neither agree nor disagree
Agree
Strongly agree

Version 1.0 23/04/2011
Section E. Down Farm Multiple Choice Questions

Question E6.
The archaeology within this landscape is...
- Spread evenly throughout
- Concentrated on the North slope
- Concentrated on the valley floor
- In clusters throughout the valley
- Other (Please specify below)

Question E7.
The barrow which lies under the fence has a dip on its top. This dip frames the barrow behind. Do you...
- Strongly disagree
- Disagree
- Neither agree nor disagree
- Agree
- Strongly agree

Question E8.
In your opinion, which is the most prominent feature in the landscape?
- The henges
- The valley
- The barrows
- The Dorset Cursus
- Other (Please specify below)

Please turn over for the final section of the questionnaire
Section F. Questionnaire Review

Please now take the time to review this questionnaire so that it can be improved for future use.

Was the scale for level of archaeological knowledge detailed enough? Should there be more categories and if so what should they be?

Was there any part of the questionnaire which was not clear/ could have been explained better. If so how could it be improved?

Could any of the questions be improved? If so, how?

If you completed both halves of this questionnaire, do you feel that Section C, the Barkerley Dyke multiple choice questions, affected how you answered Section D on Down Farm? If you completed only one half, do you feel that seeing the multiple choice questions first would have affected your other answers?

If you have any other comments on this questionnaire, for example about the design, questions, recording method, or the project in general please detail them below.

Thank you for assisting in this research by completing this questionnaire.
Appendix 2- Final Questionnaire

Stonehenge Landscape Questionnaire

Thank you for choosing to take part in this research, we hope that it will improve your experience at Stonehenge. This questionnaire should be answered whilst at the stones.

There are three sections in this questionnaire, 1- demographic information, 2- open questions and 3- multiple choice questions. Please answer all of the questions below as best as you can. We are interested primarily in topography, but don't worry if you do not understand something, there are no correct answers.

* Required

I have read and understood the study information and consent to take part *

Section 1- Demographics

Please fill in the boxes below to tell us a little bit about yourself. This information will be used to understand what characteristics have an effect on the perception of the landscape.

Please pick the option which best describes your gender *

- Female
- Male
- Other

Please pick the appropriate category for your age *

- 18-29
- 30-59
- 60+
Please pick the category that best describes your knowledge of British archaeology *

- None/ very little
- Some general knowledge
- Undergraduate student/ amateur archaeologist
- Postgraduate student
- Professional

Please pick the category that best describes your familiarity with British landscapes *

- None/ very unfamiliar
- Some familiarity
- Familiar
- Very familiar

Please describe your cultural background, e.g. British, American-Chinese, Australian of European descent etc. *

Your answer

Did you listen to the audio guide or read the guidebook during your visit? *

- Yes
- No
Section 2- Open Questions

Please answer the questions below to the best of your ability. The fold out map provided at the ticket office or the map below may be of use in identifying the features in the questions. Try not to use the map to inform your answers though.

You may write as much or as little as you like. Please complete this section before the next section.

It may help to know that North is to your left as you walk up the path to Stonehenge from the bus stop and that questions may refer to features in the wider landscape. It may also help to follow the clockwise route marked by the numbered signs, if the whole path is open. To help you to identify features in the landscape, the numbered audio guide signs will be used for suggested viewing spots the first time a feature is mentioned.

If for any question you are not sure what to write, just answer "don't know".

Map

Stand near sign 3, turn to face away from Stonehenge and look out into the landscape. To your left will be the Cursus Barrows, and to your right, to the left of the road, will be the King Barrows.
1/19) What do you notice about the sizes of the Cursus Barrows? *
Your answer

This question was intended to look at size perception

2/19) What do you notice about the location of the King Barrows? *
Your answer

This question was intended to the perception of topographic relationship of features with ridge tops

3/19) If you can, describe the distribution of the King Barrows *
Your answer

This question was intended to look at perception of distribution and orientation

Continue round until you reach sign 5. For question 5 face away from Stonehenge

4/19) What do you notice about the relationship between the stone uprights and the ditch of Stonehenge? *
Your answer

This question was intended to look at perception of enclosing relationships

5/19) Look towards the Normanton Down Barrows and notice the fence running away from you. Describe the relationship between the two barrows to the left of that fence *
Your answer

This question was intended to look at perception of occlusion

Turn in a circle looking at the landscape all around Stonehenge

6/19) Describe the horizon around Stonehenge *
Your answer

This question was intended to look at perception of the horizon and contiguity

XV
7/19) What do you think is the highest point in the landscape? *
Your answer

This question was intended to look at perception of relative height

8/19) Describe the relationship of the road to the landscape *
Your answer

This question was intended to look at perception of topographic relationships and bisection

Section 3- Multiple Choice Questions

Thank you for answering the questions so far, now for some quick multiple choice questions to finish. Please answer the questions below to the best of your ability. Pick the one option that you think best answers the question.

Please complete the previous section first and do not go back to change your answers.

9/19) Describe the terrain of the landscape *

- Flat
- Very hilly
- Gently undulating
- Hilly

This question was intended to look at perception of wide-scale topographic conditions

10/19) The Cursus Barrows are… *

- A mixture of 2 shapes
- All different shapes
- A mixture of 3 shapes
- All the same shape

This question was intended to look at perception of shape
11/19) Describe the role of the Cursus in the landscape. Use the map to help you identify its location (the bridge is a good location to view where it is)*

- To mark a route through the landscape
- To serve as a boundary
- To close off part of the landscape
- To mark an alignment between parts of the landscape

*This question was intended to look at perception of higher order spatial relationships

12/19) The King Barrows... *

- Have no relation to the horizon
- Are placed just below the horizon
- Are placed on the horizon
- Are a mix of on the horizon and not

*This question was intended to look at perception of relationship with the horizon

13/19) The Normanton Down Barrows are... *

- On elevated flat ground
- On the side of a slope
- On flat ground
- On a ridge

*This question was intended to look at perception of topographic relationships
14/19) Look towards the Normanton Down Barrows and notice the fence running away from you. Describe the relationship between the two barrows to the left of that fence *

- They are distant from each other
- One obstructs the view of the other
- One is a lot closer to Stonehenge
- They are next to each other

This question was intended to look at perception of occlusion

15/19) Describe the distribution of the Normanton Down Barrows *

- Spread out
- In a line
- Clustered
- Unevenly spaced

This question was intended to look at perception of distribution

16/19) Describe the relationship between the stone uprights and the ditch of Stonehenge *

- The ditch matches the shape of the stones
- The stones are not enclosed by the ditch
- The ditch encloses the stone uprights
- There is no relationship

This question was intended to look at perception of enclosing relationships
17/19) Describe the horizon around Stonehenge *

- Continuous
- Interrupted
- Acts as a boundary

*This question was intended to look at perception of the horizon and contiguity*

18/19) Which is closest to Stonehenge, the Normanton Down Barrow group or the Cursus Barrow group? *

- They are the same distance
- Normanton Down Barrow group
- Cursus Barrow group

*This question was intended to look at distance perception*

19/19) Describe the distribution of the ancient man made things in the landscape *

- Clustered in the North
- Only on high ground
- Clustered in specific areas
- Evenly distributed
- Clustered in the South
- Only on flat ground

*This question was intended to look at perception of landscape wide distribution*
All done!

Thanks for taking part in this research. If you are using it, please make sure you are connected to the Wi-Fi before submitting this form. The signal can drop out at Stonehenge due to the distance from the visitor centre. After submitting this form you may close the page.

If you wish to contact the researcher for any reason, please email dacb106@soton.ac.uk

If you would like to, please leave a few words which you feel best describe the landscape

Your answer
## Appendix 3- Questionnaire Responses

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Knowledge of British Archaeology</th>
<th>Familiarity with British Landscapes</th>
<th>Cultural Background</th>
<th>Use of Guide Materials?</th>
<th>1- What do you notice about the sizes of the Cursus Barrows?</th>
<th>2- What do you notice about the location of the Cursus Barrows?</th>
<th>1- What do you notice about the sizes of the Cursus Barrows?</th>
<th>2- What do you notice about the location of the King Barrows?</th>
<th>Categorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>None/Very unfamilar</td>
<td>Asian American</td>
<td>Yes</td>
<td>Very small mounds</td>
<td>Small</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Oblong</td>
<td>Nothing or N/A</td>
<td>On top of a hill in circle</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>Australian</td>
<td>Yes</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>On hills</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>None/Very unfamilar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Big</td>
<td>Near trees, East of Stonehenge</td>
<td>Close to trees</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>Brazilian</td>
<td>No</td>
<td>Big</td>
<td>Big</td>
<td>They fan out in the landscape</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Large</td>
<td>Big</td>
<td>Surrounded by trees</td>
<td>Close to trees</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Very Familiar</td>
<td>British</td>
<td>Yes</td>
<td>20m wide 10m high</td>
<td>Big</td>
<td>On a low hill, by trees</td>
<td>On a ridge close to trees</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Female</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Big</td>
<td>Elevated and run N/S</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Male</td>
<td>30-59</td>
<td>Postgraduate</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Large</td>
<td>Big</td>
<td>On a ridge</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Female</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a hilltop that overlooks Stonehenge, near to trees</td>
<td>On a ridge close to trees</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td>Age Range</td>
<td>Knowledge Level</td>
<td>Familiarity</td>
<td>Nationality</td>
<td>Size</td>
<td>Location</td>
<td>Distance from Trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>--------</td>
<td>-----------</td>
<td>----------------</td>
<td>-------------</td>
<td>-------------</td>
<td>------</td>
<td>----------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Very Familiar</td>
<td>British</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge</td>
<td>On a ridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Male</td>
<td>18-29</td>
<td>None/Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>Close to trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge close to trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Male</td>
<td>30-59</td>
<td>None/Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Similar sizes</td>
<td>Similar sizes</td>
<td>On a ridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Female</td>
<td>30-59</td>
<td>Professional</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On high ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>Yes</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On the horizon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Similar sizes</td>
<td>Similar sizes</td>
<td>On a ridge and on the horizon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Male</td>
<td>30-59</td>
<td>Professional</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge close to trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Female</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Similar sizes</td>
<td>Similar sizes</td>
<td>On a ridge, in a line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Male</td>
<td>60+</td>
<td>Undergraduate/Amateur</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Big</td>
<td>Big</td>
<td>Visible</td>
<td>In a prominent location</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Male</td>
<td>30-59</td>
<td>Professional</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge close to trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Female</td>
<td>18-29</td>
<td>Undergraduate/Amateur</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Not very big</td>
<td>Small</td>
<td>Within the tree line</td>
<td>Close to trees</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Male</td>
<td>30-59</td>
<td>Professional</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Big</td>
<td>In a dominant position, by trees</td>
<td>In a prominent location</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Gender</td>
<td>Age Range</td>
<td>Education</td>
<td>Familiarity</td>
<td>Nationality</td>
<td>Knowledge of Other Language</td>
<td>Size</td>
<td>Location</td>
<td>Notes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>-----------</td>
<td>-----------</td>
<td>-------------</td>
<td>-------------</td>
<td>----------------------------</td>
<td>------</td>
<td>----------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Male</td>
<td>30-59</td>
<td>Undergraduate/Amateur</td>
<td>Very Familiar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Big</td>
<td>On the skyline</td>
<td>On the horizon</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>Yes</td>
<td>Similar sizes</td>
<td>Similar sizes</td>
<td>Close to Stonehenge</td>
<td>Close to Stonehenge</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Female</td>
<td>60+</td>
<td>None/Very Little</td>
<td>None/Very unfamiliar</td>
<td>South African</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>A burial ground</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>One bigger than the others</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>Close together, in a line</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Medium</td>
<td>Medium sized</td>
<td>Spread out</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On flat land</td>
<td>On flat ground</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge, by trees</td>
<td>On a ridge close to trees</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>They run N/S</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>French-German</td>
<td>No</td>
<td>Small</td>
<td>Small</td>
<td>Big</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Familiar</td>
<td>Chinese</td>
<td>No</td>
<td>Big</td>
<td>Big</td>
<td>Behind Stonehenge</td>
<td>Describes orientation relative to Stonehenge</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Male</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>Chinese</td>
<td>Yes</td>
<td>Big</td>
<td>Big</td>
<td>South of Stonehenge</td>
<td>Describes orientation relative to Stonehenge</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>Chinese</td>
<td>No</td>
<td>Very big</td>
<td>Big</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
</tr>
<tr>
<td>Participant</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------</td>
<td>----------------</td>
<td>----------</td>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Equal radius</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Sky to grass</td>
<td>Nothing or N/A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Ditch surrounds</td>
<td>Stonehenge</td>
<td>They are the same size</td>
<td>Same size</td>
<td>Stonehenge is at the high point</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Even and symmetrical</td>
<td>Equally spaced</td>
<td>There is one</td>
<td>Other</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Evenly spaced</td>
<td>Equally spaced</td>
<td>Stonehenge is in the middle</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>It differs.</td>
<td>Mainly trees</td>
<td>Varies, has trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Larger to the South</td>
<td>Larger to South</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>They look attached</td>
<td>Close together or attached</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Uniformly spaced</td>
<td>Equally spaced</td>
<td>The ditch surrounds Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Overlooks land, high</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>In a line</td>
<td>In a line</td>
<td>The ditch is outside</td>
<td>The ditch surrounds Stonehenge</td>
<td>Linked</td>
<td>Close together or attached</td>
<td>Low, visible on all side</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Open vista, high</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Equally spaced in a line</td>
<td>Equally spaced line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>A broken ring around the site</td>
<td>Varies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>---------------</td>
<td>----------------------------</td>
<td>-------------------------------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Equally spaced in a line</td>
<td>Equally spaced line</td>
<td>Stonehenge is inside the ditch</td>
<td>The ditch surrounds Stonehenge</td>
<td>They are close, one is in front</td>
<td>Close and one occludes the other</td>
<td>Different distances away, broken</td>
<td>Varies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>They are close, one obstructs the view of the other</td>
<td>Close and one occludes the other</td>
<td>Interrupted, different distances</td>
<td>Varies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Different across the landscape</td>
<td>Varies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>The ditch surrounds Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Distant, has trees on it</td>
<td>Distant, has trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Uneven</td>
<td>Unevenly spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>In a line</td>
<td>In a line</td>
<td>Dotted with barrows</td>
<td>Has barrows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>In an even line</td>
<td>In a line</td>
<td>They respect one another</td>
<td>They respect one another</td>
<td>One obscures the other</td>
<td>One occludes the other</td>
<td>Undulating</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Uneven</td>
<td>Unevenly spaced</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Has copses of trees</td>
<td>Has trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>In two staggered lines</td>
<td>In 2 staggered lines</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>They are the same size</td>
<td>Same size</td>
<td>Surrounded by trees</td>
<td>Has trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>In a line</td>
<td>In a line</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>In a line</td>
<td>In a line</td>
<td>It's for defence</td>
<td>Other</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Has barrows on it</td>
<td>Has barrows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Unevenly distributed</td>
<td>Unevenly spaced</td>
<td>The ditch encloses Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Higher in west, has barrows and trees</td>
<td>Varies, has trees and barrows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Undulating, Stonehenge is visible</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>In a line</td>
<td>In a line</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>A wide shallow bowl</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>They are different shapes</td>
<td>Other</td>
<td>Open, interspersed with trees</td>
<td>Has trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>They are next to each other</td>
<td>Close together or attached</td>
<td>Undulating</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Equally spaced in a line</td>
<td>Equally spaced line</td>
<td>It's for defence</td>
<td>Other</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Undulating</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Uneven spaced</td>
<td>Equally spaced all around</td>
<td>Evenly spaced all around</td>
<td>Attached and the same size</td>
<td>Attached and the same size</td>
<td>High, with dips</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Equally spaced in a line</td>
<td>Equally spaced line</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Undulating height</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Spread out</td>
<td>Spread out</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Flat</td>
<td>Flat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Flat</td>
<td>Flat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>High, interspersed woods</td>
<td>High, has trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>They follow the ridge</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Hilly, has trees</td>
<td>High, has trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Identical</td>
<td>Other</td>
<td>Hilly</td>
<td>Undulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part 3</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
<td>----------------</td>
<td>----------</td>
<td>----------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>What do you think is the highest point in the landscape?</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Gently Undulating</td>
<td>To serve as a boundary</td>
<td>Are a mix of on the horizon and not</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Describe the relationship of the road to the landscape</td>
<td>N/A</td>
<td>Close to Stonehenge</td>
<td>Close to Stonehenge</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Describe the terrain of the landscape</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>A blight</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>The Cursus Barrows are...</td>
<td>South east of Stonehenge</td>
<td>Close to Stonehenge</td>
<td>Close to Stonehenge</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are a mix of on the horizon and not</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Describe the role of the Cursus in the landscape</td>
<td>East</td>
<td>Separates the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>The King Barrows...</td>
<td>East</td>
<td>Separates the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Goes through landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>------------</td>
<td>-------------------------</td>
<td>---------------------------</td>
<td>------------------</td>
<td>----------------------</td>
<td>--------------------------------------</td>
<td>--------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Goes through landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Runs East-West</td>
<td>Runs East-West</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>Close to the King Barrows</td>
<td>Close to the Kings Barrows</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Stonehenge/ South-East ridge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>South-East ridge</td>
<td>East</td>
<td>Cuts through the landscape, lower than Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Hill to distant east</td>
<td>Distant East</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>North east in the distance</td>
<td>North</td>
<td>Slopes down, not overly visible</td>
<td>Not very visible</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To close off part of the landscape</td>
<td>Are placed just below the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Runs along the hillside</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To serve as a boundary</td>
<td>Are a mix of on the horizon and not</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>North</td>
<td>North</td>
<td>Parallel to the Cursus</td>
<td>Parallel to Cursus</td>
<td>Hilly</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Follows contours, lower than Stonehenge</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Follows contours, lower than Stonehenge</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To close off part of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Blends in</td>
<td>Not very visible</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To close off part of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Don’t know</td>
<td>Nothing or N/A</td>
<td>It is part of the landscape</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>North west</td>
<td>North</td>
<td>Follows the contours</td>
<td>Follows the contours</td>
<td>Very Hilly</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Have no relation to the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>North- Larkhill</td>
<td>North</td>
<td>Follows a dry valley</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>South, beyond Normanton Down</td>
<td>South</td>
<td>Very visible</td>
<td>Very visible</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To close off part of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Intrusive, cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Runs East-West, probably an older route</td>
<td>Runs East-West</td>
<td>Hilly</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Have no relation to the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Distant ridge to NE</td>
<td>North</td>
<td>Follows a valley</td>
<td>Follows the contours</td>
<td>Very Hilly</td>
<td>All different shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Distant ridge to NE</td>
<td>North</td>
<td>Follows the contours</td>
<td>Follows the contours</td>
<td>Very Hilly</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Intrusive</td>
<td>Very visible</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>West</td>
<td>West</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Follows the contours</td>
<td>Follows the contours</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>West</td>
<td>West</td>
<td>East-West</td>
<td>Runs East-West</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>West</td>
<td>West</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Very Hilly</td>
<td>All the same shape</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>Slopes up to the horizon</td>
<td>Other</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Flat</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Bus stop</td>
<td>Bus stop</td>
<td>Parallel</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Have no relation to the horizon</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Close to Stonehenge</td>
<td>Close to Stonehenge</td>
<td>Hilly</td>
<td>A mixture of 3 shapes</td>
<td>N/A</td>
<td>Are a mix of on the horizon and not</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Are a mix of on the horizon and not</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part 4**

<table>
<thead>
<tr>
<th>Participant</th>
<th>13- The Normanton Down Barrows are...</th>
<th>14- Describe the relationship between the two barrows to the left of the fence running towards Normanton Down</th>
<th>15- Describe the distribution of the Normanton Down Barrows</th>
<th>16- What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?</th>
<th>17- Describe the horizon around Stonehenge</th>
<th>18- Which is the closest to Stonehenge, Normanton Down or Cursus Barrows?</th>
<th>19- Describe the distribution of the ancient man made things in the landscape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On elevated flat ground</td>
<td>One obstructs the view of the other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in the South</td>
</tr>
<tr>
<td>2</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Only on flat ground</td>
</tr>
<tr>
<td>3</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch matches the shape of the stones</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
<td>Only on high ground</td>
</tr>
</tbody>
</table>

XXX
<table>
<thead>
<tr>
<th></th>
<th>Location</th>
<th>Relationship to Each Other</th>
<th>Spacing</th>
<th>Ditch Description</th>
<th>Boundary Function</th>
<th>Grouping</th>
<th>Ground Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>On flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Only on flat ground</td>
</tr>
<tr>
<td>5</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>6</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Only on high ground</td>
</tr>
<tr>
<td>7</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>8</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Only on high ground</td>
</tr>
<tr>
<td>9</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>10</td>
<td>On flat ground</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Only on high ground</td>
</tr>
<tr>
<td>11</td>
<td>On flat ground</td>
<td>One obstructs the view of the other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>12</td>
<td>On the side of a slope</td>
<td>One obstructs the view of the other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>13</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>14</td>
<td>On elevated flat ground</td>
<td>One obstructs the view of the other</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Evenly distributed</td>
</tr>
<tr>
<td>15</td>
<td>On a ridge</td>
<td>One obstructs the view of the other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>16</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>17</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td></td>
<td>On elevated flat ground</td>
<td>On a ridge</td>
<td>On a ridge</td>
<td>On elevated flat ground</td>
<td>On a ridge</td>
<td>On a ridge</td>
<td>On elevated flat ground</td>
</tr>
<tr>
<td>---</td>
<td>------------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>18</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>19</td>
<td>On elevated flat ground</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>20</td>
<td>On a ridge</td>
<td>One obstructs the view of the other</td>
<td>In a line</td>
<td>The ditch matches the shape of the stones</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Only on high ground</td>
</tr>
<tr>
<td>21</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>23</td>
<td>On a ridge</td>
<td>N/A</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>24</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>They are the same distance</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>25</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Normanton Down Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>26</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch matches the shape of the stones</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
<td>Evenly distributed</td>
</tr>
<tr>
<td>27</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>There is no relationship</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>28</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>29</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>30</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
<td>Clustered in specific areas</td>
</tr>
<tr>
<td>31</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
<td>Only on high ground</td>
</tr>
</tbody>
</table>

XXXII
<table>
<thead>
<tr>
<th></th>
<th>Location</th>
<th>Relationship</th>
<th>Spacing</th>
<th>Function of Ditch</th>
<th>Barrow Group</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Normanton Down Barrow group</td>
</tr>
<tr>
<td>33</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>34</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>35</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>36</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>37</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch matches the shape of the stones</td>
<td>Acts as a boundary</td>
<td>Normanton Down Barrow group</td>
</tr>
<tr>
<td>38</td>
<td>On the side of a slope</td>
<td>They are distant from each other</td>
<td>Spread out</td>
<td>There is no relationship</td>
<td>Continuous</td>
<td>They are the same distance</td>
</tr>
<tr>
<td>39</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>40</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Normanton Down Barrow group</td>
</tr>
</tbody>
</table>
Frequency Tables

1- What do you notice about the sizes of the Cursus Barrows?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Small</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Medium sized</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Big</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>Different sizes</td>
<td>15</td>
<td>37.5%</td>
</tr>
<tr>
<td>Similar sizes</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

2- What do you notice about the location of the King Barrows?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>On a ridge</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>On flat ground</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>On the horizon</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Close to trees</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>On a ridge and on the horizon</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>On a ridge close to trees</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>In a prominent location</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Describes orientation relative to Stonehenge</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Close to Stonehenge</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
3- If you can, describe the distribution of the King Barrows

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>In a line</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>In 2 staggered lines</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Equally spaced</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>Unevenly spaced</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Spread out</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Larger to South</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Equally spaced line</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

4- What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>The ditch surrounds Stonehenge</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>They form concentric circles</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>There is even spacing between them all the way round</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>They respect one another</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

5- Describe the relationship between the two barrows to the left of the fence running towards Normanton Down

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>10</td>
<td>25.0%</td>
</tr>
<tr>
<td>Same size</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Close together or attached</td>
<td>19</td>
<td>47.5%</td>
</tr>
<tr>
<td>One occludes the other</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>In a line</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Close and one occludes the other</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Attached and the same size</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
6- Describe the horizon around Stonehenge

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>High</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Flat</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Undulating</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>Has trees</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Has barrows</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Varies</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Varies, has trees</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Varies, has trees and barrow</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Distant, has trees</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>High, has trees</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

7- What do you think is the highest point in the landscape?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>Stonehenge</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>Kings Barrows</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>East</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Distant East</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>North</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>South</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>West</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Bus stop</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
8- Describe the relationship of the road to the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Cuts through the landscape</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>Follows the contours</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Runs East-West</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Close to Stonehenge</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Close to the Kings Barrows</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Parallel to Cursus</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Very visible</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Not very visible</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

9- Describe the terrain of the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Hilly</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Hilly</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>Gently Undulating</td>
<td>26</td>
<td>65.0%</td>
</tr>
<tr>
<td>Flat</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

10- The Cursus Barrows are...

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>All the same shape</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>A mixture of 2 shapes</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>A mixture of 3 shapes</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>All different shapes</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

11- Describe the role of the Cursus in the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>To mark a route through the landscape</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>To close off part of the landscape</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>To mark an alignment between parts of the landscape</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>To serve as a boundary</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
12- The King Barrows...

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Have no relation to the horizon</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Are a mix of on the horizon and not</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Are placed on the horizon</td>
<td>25</td>
<td>62.5%</td>
</tr>
<tr>
<td>Are placed just below the horizon</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

13- The Normanton Down Barrows are...

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>On elevated flat ground</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>On the side of a slope</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>On flat ground</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>On a ridge</td>
<td>17</td>
<td>42.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

14- Describe the relationship between the two barrows to the left of the fence running towards Normanton Down

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>They are distant from each other</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>They are next to each other</td>
<td>27</td>
<td>67.5%</td>
</tr>
<tr>
<td>One obstructs the view of the other</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

15- Describe the distribution of the Normanton Down Barrows

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Spread out</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>In a line</td>
<td>10</td>
<td>25.0%</td>
</tr>
<tr>
<td>Clustered</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>Unevenly spaced</td>
<td>18</td>
<td>45.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

XXXVIII
16- What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>The ditch encloses the stone uprights</td>
<td>25</td>
<td>62.5%</td>
</tr>
<tr>
<td>There is no relationship</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>The ditch matches the shape of the stones</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

17- Describe the horizon around Stonehenge

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Interrupted</td>
<td>10</td>
<td>25.0%</td>
</tr>
<tr>
<td>Continuous</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Acts as a boundary</td>
<td>19</td>
<td>47.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

18- Which is the closest to Stonehenge, Normanton Down or Cursus barrows?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Cursus Barrow group</td>
<td>30</td>
<td>75.0%</td>
</tr>
<tr>
<td>They are the same distance</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Normanton Down Barrow group</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

19- Describe the distribution of the ancient man made things in the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Clustered in the South</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Clustered in specific areas</td>
<td>20</td>
<td>50.0%</td>
</tr>
<tr>
<td>Evenly distributed</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Only on high ground</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Only on flat ground</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Appendix 4- Demographic Variables Crosstabulation
Due to the size of the output, the demographic variable crosstabulation can be found in Excel format on the accompanying DVD.

Appendix 5- Question and Variable Crosstabulation / Fisher's Exact Tests
Due to the size of the output, the question/variable crosstabulation and Fisher’s Exact Tests can be found in Excel format on the accompanying DVD.

Appendix 6- Question Crosstabulation for Log-linear Analysis
Due to the size of the output, the log-linear analysis crosstabulation can be found in Excel format on the accompanying DVD.

Appendix 7- Full Log-linear Analysis
Due to the size of the output, the log-linear analysis can be found in Excel format on the accompanying DVD. In order to carry out the log-linear analysis 0.5 has been automatically added to the cell count of all cells. Cases out of range correspond to “Nothing or N/A” responses which have been excluded from the analysis.

Appendix 8- Multiple Answer vs Single Answer Respondents Fisher’s Exact Test
Due to the size of the output, the multiple vs single answer respondents Fisher’s Exact Test can be found in Excel format on the accompanying DVD.
## Appendix 9- Collapsed Questionnaire Responses

### Part 1

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Knowledge of British Archaeology</th>
<th>Familiarity with British Landscapes</th>
<th>Cultural Background</th>
<th>Use of Guide Materials?</th>
<th>1- What do you notice about the sizes of the Cursus Barrows?</th>
<th>1- What do you notice about the sizes of the Cursus Barrows?</th>
<th>2- What do you notice about the location of the King Barrows?</th>
<th>2- What do you notice about the location of the King Barrows?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>None/Very unfamiliar</td>
<td>Asian</td>
<td>Yes</td>
<td>Very small mounds</td>
<td>Similar sizes</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Oblong</td>
<td>Nothing or N/A</td>
<td>On top of a hill in circle</td>
<td>On a ridge</td>
</tr>
<tr>
<td>3</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>Australian</td>
<td>Yes</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>On hills</td>
<td>On a ridge</td>
</tr>
<tr>
<td>4a</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>None/Very unfamiliar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Similar sizes</td>
<td>Near trees, East of Stonehenge</td>
<td>Close to trees</td>
</tr>
<tr>
<td>5</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>Brazilian</td>
<td>No</td>
<td>Big</td>
<td>Similar sizes</td>
<td>They fan out in the landscape</td>
<td>Other</td>
</tr>
<tr>
<td>6</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Large</td>
<td>Similar sizes</td>
<td>Surrounded by trees</td>
<td>Close to trees</td>
</tr>
<tr>
<td>7a</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>Yes</td>
<td>20m wide 10m high</td>
<td>Similar sizes</td>
<td>On a low hill, by trees</td>
<td>On a ridge</td>
</tr>
<tr>
<td>8</td>
<td>Female</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Similar sizes</td>
<td>Elevated and run N/S</td>
<td>On a ridge</td>
</tr>
<tr>
<td>9</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Large</td>
<td>Similar sizes</td>
<td>On a ridge</td>
<td>On a ridge</td>
</tr>
<tr>
<td>10a</td>
<td>Female</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a hilltop that overlooks Stonehenge, near trees</td>
<td>On a ridge</td>
</tr>
<tr>
<td>11a</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge</td>
<td>On a ridge</td>
</tr>
<tr>
<td>12</td>
<td>Male</td>
<td>18-29</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>By trees</td>
<td>Close to trees</td>
</tr>
<tr>
<td>No.</td>
<td>Gender</td>
<td>Age</td>
<td>Knowledge</td>
<td>Familiarity</td>
<td>Origin</td>
<td>Similar Sizes</td>
<td>Different Sizes</td>
<td>Location Details</td>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>--------</td>
<td>-----</td>
<td>-----------</td>
<td>------------</td>
<td>--------</td>
<td>---------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>13a</td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>On a ridge, following the tree line</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Similar sizes</td>
<td>On a ridge</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Female</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>On high ground</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>Yes</td>
<td>Different sizes</td>
<td>On the horizon</td>
<td>On the horizon</td>
<td></td>
</tr>
<tr>
<td>17a</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Similar sizes</td>
<td>On a ridge, on the horizon</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>18a</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>On a ridge, by trees</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Female</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Similar sizes</td>
<td>On a ridge, in a line</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Male</td>
<td>60+</td>
<td>Knowledgeable</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Big</td>
<td>Similar sizes</td>
<td>Visible</td>
<td>In a prominent location</td>
</tr>
<tr>
<td>21a</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>On a ridge</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>23a</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Different sizes</td>
<td>On a ridge, by trees</td>
<td>On a ridge</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Female</td>
<td>18-29</td>
<td>Knowledgeable</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>Not very big</td>
<td>Similar sizes</td>
<td>Within the tree line</td>
<td>Close to trees</td>
</tr>
<tr>
<td>25</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Similar sizes</td>
<td>In a dominant position, by trees</td>
<td>In a prominent location</td>
</tr>
<tr>
<td>26</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Big</td>
<td>Similar sizes</td>
<td>On the skyline</td>
<td>On the horizon</td>
</tr>
<tr>
<td>27</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>Yes</td>
<td>Similar sizes</td>
<td>Close to Stonehenge</td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>28</strong></td>
<td>Female</td>
<td>60+</td>
<td>None/Very Little</td>
<td>None/Very unfamiliar</td>
<td>South African</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>A burial ground</td>
<td>Other</td>
</tr>
<tr>
<td><strong>29a</strong></td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>One bigger than the others</td>
<td>Other</td>
</tr>
<tr>
<td><strong>30</strong></td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>Close together, in a line</td>
<td>Other</td>
</tr>
<tr>
<td><strong>31</strong></td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Medium</td>
<td>Similar sizes</td>
<td>Spread out</td>
<td>Other</td>
</tr>
<tr>
<td><strong>32</strong></td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On flat land</td>
<td>Other</td>
</tr>
<tr>
<td><strong>33a</strong></td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>On a ridge, by trees</td>
<td>On a ridge</td>
</tr>
<tr>
<td><strong>34a</strong></td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>Different sizes</td>
<td>Different sizes</td>
<td>They run N/S</td>
<td>Other</td>
</tr>
<tr>
<td><strong>35</strong></td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>French-German</td>
<td>No</td>
<td>Small</td>
<td>Similar sizes</td>
<td>Big</td>
<td>Other</td>
</tr>
<tr>
<td><strong>36</strong></td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Familiar</td>
<td>Chinese</td>
<td>No</td>
<td>Big</td>
<td>Similar sizes</td>
<td>Behind Stonehenge</td>
<td>Other</td>
</tr>
<tr>
<td><strong>37</strong></td>
<td>Male</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>Chinese</td>
<td>Yes</td>
<td>Big</td>
<td>Similar sizes</td>
<td>South of Stonehenge</td>
<td>Other</td>
</tr>
<tr>
<td><strong>38</strong></td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>Chinese</td>
<td>No</td>
<td>Very big</td>
<td>Similar sizes</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td><strong>39</strong></td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>Chinese</td>
<td>Yes</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td><strong>40</strong></td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>Chinese</td>
<td>Yes</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td><strong>4b</strong></td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>None/Very unfamiliar</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>7b</strong></td>
<td>Male</td>
<td>60+</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Close to trees</td>
</tr>
</tbody>
</table>

XLIII
<p>| | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10b</td>
<td>Female</td>
<td>18-29</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11b</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>13b</td>
<td>Male</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>17b</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18b</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21b</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>23b</td>
<td>Female</td>
<td>30-59</td>
<td>Some General Knowledge</td>
<td>Some Familiarity</td>
<td>American</td>
<td>Yes</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>29b</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>33b</td>
<td>Female</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>34b</td>
<td>Male</td>
<td>30-59</td>
<td>None/Very Little</td>
<td>Some Familiarity</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>21c</td>
<td>Male</td>
<td>30-59</td>
<td>Knowledgeable</td>
<td>Familiar</td>
<td>British</td>
<td>No</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Participant</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
<td>Response</td>
<td>Categorisation</td>
</tr>
<tr>
<td>-------------</td>
<td>----------</td>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
<td>----------</td>
<td>---------------</td>
</tr>
<tr>
<td>1</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Equal radius</td>
<td>They form concentric circles</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Sky to grass</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>2</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Ditch surrounds Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>They are the same size</td>
<td>Same size</td>
<td>Stonehenge is at the high point</td>
<td>Low</td>
</tr>
<tr>
<td>3</td>
<td>Even and symmetrical</td>
<td>Equally spaced</td>
<td>There is one</td>
<td>Other</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>Undulating</td>
</tr>
<tr>
<td>4</td>
<td>Evenly spaced</td>
<td>Equally spaced</td>
<td>Stonehenge is in the middle</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>It differs. Mainly trees</td>
<td>Undulating</td>
</tr>
<tr>
<td>5</td>
<td>Larger to the South</td>
<td>Other</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>They look attached</td>
<td>Close together or attached</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>6</td>
<td>Uniformly spaced</td>
<td>Equally spaced</td>
<td>The ditch surrounds Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Overlooks land, high</td>
<td>High</td>
</tr>
<tr>
<td>7</td>
<td>In a line</td>
<td>In a line</td>
<td>The ditch is outside</td>
<td>The ditch surrounds Stonehenge</td>
<td>Linked</td>
<td>Close together or attached</td>
<td>Low, visible on all side</td>
<td>Low</td>
</tr>
<tr>
<td>8</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Open vista, high</td>
<td>High</td>
</tr>
<tr>
<td>9</td>
<td>Equally spaced in a line</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>A broken ring around the site</td>
<td>Undulating</td>
</tr>
<tr>
<td>10</td>
<td>Equally spaced in a line</td>
<td>Equally spaced</td>
<td>Stonehenge is inside the ditch</td>
<td>The ditch surrounds Stonehenge</td>
<td>They are close, one is in front</td>
<td>Close together or attached</td>
<td>Different distances away, broken</td>
<td>Undulating</td>
</tr>
<tr>
<td>11</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>They are close, one obstructs the view of the other</td>
<td>Close together or attached</td>
<td>Interrupted, different distances</td>
<td>Undulating</td>
</tr>
<tr>
<td>12</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Different across the landscape</td>
<td>Undulating</td>
</tr>
<tr>
<td>13</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>The ditch surrounds Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Distant, has trees on it</td>
<td>Has trees</td>
</tr>
<tr>
<td>14</td>
<td>Uneven</td>
<td>Unevenly distributed</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>In a line</td>
<td>Other</td>
<td>Dotted with barrows</td>
<td>Has barrows</td>
</tr>
<tr>
<td>15</td>
<td>In an even line</td>
<td>In a line</td>
<td>They respect one another</td>
<td>They respect one another</td>
<td>One obscures the other</td>
<td>One occludes the other</td>
<td>Undulating</td>
<td>Undulating</td>
</tr>
<tr>
<td>16</td>
<td>Uneven</td>
<td>Unevenly distributed</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Has copses of trees</td>
<td>Has trees</td>
</tr>
<tr>
<td>17</td>
<td>In two staggered lines</td>
<td>Other</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>They are the same size</td>
<td>Same size</td>
<td>Surrounded by trees</td>
<td>Has trees</td>
</tr>
<tr>
<td>18</td>
<td>In a line</td>
<td>In a line</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>19</td>
<td>In a line</td>
<td>In a line</td>
<td>It's for defence</td>
<td>Other</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>20</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Has barrows on it</td>
<td>Has barrows</td>
</tr>
<tr>
<td>21</td>
<td>Unevenly distributed</td>
<td>Unevenly distributed</td>
<td>The ditch encloses Stonehenge</td>
<td>The ditch surrounds Stonehenge</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Higher in west, has barrows and trees</td>
<td>Undulating</td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>23</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>Undulating</td>
</tr>
<tr>
<td>24</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Undulating, Stonehenge is visible</td>
<td>Undulating</td>
</tr>
<tr>
<td>25</td>
<td>In a line</td>
<td>In a line</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>A wide shallow bowl</td>
<td>Low</td>
</tr>
<tr>
<td>26</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>They are different shapes</td>
<td>Other</td>
<td>Open, interspersed with trees</td>
<td>Has trees</td>
</tr>
<tr>
<td></td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>They are next to each other</td>
<td>Close together or attached</td>
<td>Undulating</td>
<td>Undulating</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>----------------</td>
<td>---------</td>
<td>----------------</td>
<td>----------------------------</td>
<td>---------------------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>27</td>
<td>Equally spaced in a line</td>
<td>Equally spaced</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>They are next to each other</td>
<td>Close together or attached</td>
<td>Undulating</td>
<td>Undulating</td>
</tr>
<tr>
<td>28</td>
<td>Equally spaced in a line</td>
<td>Equally spaced</td>
<td>It’s for defence</td>
<td>Other</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Undulating</td>
<td>Undulating</td>
</tr>
<tr>
<td>29</td>
<td>Uneven</td>
<td>Unevenly distributed</td>
<td>Equally spaced all around</td>
<td>They form concentric circles</td>
<td>Attached and the same size</td>
<td>Same size</td>
<td>High, with dips</td>
<td>Undulating</td>
</tr>
<tr>
<td>30</td>
<td>Equally spaced in a line</td>
<td>Equally spaced</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Undulating height</td>
<td>Undulating</td>
</tr>
<tr>
<td>31</td>
<td>Spread out</td>
<td>Spread out</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>Flat</td>
<td>Flat</td>
</tr>
<tr>
<td>32</td>
<td>Equally spaced</td>
<td>Equally spaced</td>
<td>The ditch surrounds the uprights</td>
<td>The ditch surrounds Stonehenge</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Flat</td>
<td>Flat</td>
</tr>
<tr>
<td>33</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Attached</td>
<td>Close together or attached</td>
<td>High, interspersed with trees</td>
<td>High</td>
</tr>
<tr>
<td>34</td>
<td>They follow the ridge</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Close together</td>
<td>Close together or attached</td>
<td>Hilly, has trees</td>
<td>High</td>
</tr>
<tr>
<td>35</td>
<td>In a line</td>
<td>In a line</td>
<td>They are concentric circles</td>
<td>They form concentric circles</td>
<td>Identical</td>
<td>Other</td>
<td>Hilly</td>
<td>Undulating</td>
</tr>
<tr>
<td>36</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>37</td>
<td>Runs southeast of Stonehenge</td>
<td>In a line</td>
<td>They are related</td>
<td>Other</td>
<td>Complement</td>
<td>Other</td>
<td>Consistent</td>
<td>Flat</td>
</tr>
<tr>
<td>38</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Nothing</td>
<td>Nothing or N/A</td>
<td>They are in a line</td>
<td>Other</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>39</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>40</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
</tr>
<tr>
<td>4b</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Has trees</td>
</tr>
<tr>
<td></td>
<td>7b</td>
<td>10b</td>
<td>11b</td>
<td>13b</td>
<td>17b</td>
<td>18b</td>
<td>21b</td>
<td>23b</td>
</tr>
<tr>
<td>---</td>
<td>----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>One occludes the other</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>One occludes the other</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Has trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Has trees</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Has barrows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant</td>
<td>7- What do you think is the highest point in the landscape?</td>
<td>7- What do you think is the highest point in the landscape?</td>
<td>8- Describe the relationship of the road to the landscape</td>
<td>8- Describe the relationship of the road to the landscape</td>
<td>9- Describe the terrain of the landscape</td>
<td>10- The Cursus Barrows are...</td>
<td>11- Describe the role of the Cursus in the landscape</td>
<td>12- The King Barrows...</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To serve as a boundary</td>
<td>Are a mix of on the horizon and not</td>
</tr>
<tr>
<td>2</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>The road goes past</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>3</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>A blight</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>4</td>
<td>South east of Stonehenge</td>
<td>East</td>
<td>Close to Stonehenge</td>
<td>Relation to other features</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are a mix of on the horizon and not</td>
</tr>
<tr>
<td>5</td>
<td>East of Stonehenge</td>
<td>East</td>
<td>Separates the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>6</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Goes through landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>7</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Runs East-West</td>
<td>Runs East-West</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>8</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>Close to the King Barrows not Stonehenge</td>
<td>Relation to other features</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
</tr>
<tr>
<td>9</td>
<td>Stonehenge/ South-East ridge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>10</td>
<td>South-East ridge</td>
<td>East</td>
<td>Cuts through the landscape, lower than Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
</tr>
<tr>
<td>11</td>
<td>Hill to distant east</td>
<td>East</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>12</td>
<td>North east in the distance</td>
<td>North</td>
<td>Slopes down, not overly visible</td>
<td>Not very visible</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To close off part of the landscape</td>
<td>Are placed just below the horizon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Runs along the hillside</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To serve as a boundary</td>
<td>Are a mix of on the horizon and not</td>
</tr>
<tr>
<td>14</td>
<td>North</td>
<td>North</td>
<td>Parallel to the Cursus</td>
<td>Relation to other features</td>
<td>Hilly</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>15</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>16</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Follows contours, lower than Stonehenge</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To close off part of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>17</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Blends in</td>
<td>Not very visible</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To close off part of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>18</td>
<td>Don't know</td>
<td>Nothing or N/A</td>
<td>It is part of the landscape</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>19</td>
<td>North west</td>
<td>North</td>
<td>Follows the contours</td>
<td>Follows the contours</td>
<td>Very Hilly</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Have no relation to the horizon</td>
</tr>
<tr>
<td>20</td>
<td>North- Larkhill</td>
<td>North</td>
<td>Follows a dry valley</td>
<td>Follows the contours</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>21</td>
<td>South, beyond Normanton Down</td>
<td>South</td>
<td>Very visible</td>
<td>Very visible</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>N/A</td>
</tr>
<tr>
<td>23</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To close off part of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>24</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 2 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>25</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Intrusive, cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>A mixture of 3 shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>26</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Runs East-West, probably an older route</td>
<td>Runs East-West</td>
<td>Hilly</td>
<td>All the same shape</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Have no relation to the horizon</td>
</tr>
<tr>
<td>28</td>
<td>Distant ridge to NE</td>
<td>North</td>
<td>Follows a valley</td>
<td>Follows the contours</td>
<td>Very Hilly</td>
<td>All different shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed just below the horizon</td>
</tr>
<tr>
<td>29</td>
<td>Distant ridge to NE</td>
<td>North</td>
<td>Follows the contours</td>
<td>Follows the contours</td>
<td>Very Hilly</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>30</td>
<td>King Barrows</td>
<td>Kings Barrows</td>
<td>Intrusive</td>
<td>Very visible</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>31</td>
<td>West</td>
<td>West</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Gently Undulating</td>
<td>All the same shape</td>
<td>To mark a route through the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>32</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Follows the contours</td>
<td>Follows the contours</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>33</td>
<td>West</td>
<td>West</td>
<td>East-West</td>
<td>Runs East-West</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>34</td>
<td>West</td>
<td>West</td>
<td>Cuts through the landscape</td>
<td>Cuts through the landscape</td>
<td>Very Hilly</td>
<td>All the same shape</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>35</td>
<td>Kings Barrows</td>
<td>Kings Barrows</td>
<td>Slopes up to the horizon</td>
<td>Other</td>
<td>Hilly</td>
<td>A mixture of 2 shapes</td>
<td>To serve as a boundary</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>36</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Flat</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>37</td>
<td>Bus stop</td>
<td>Bus stop</td>
<td>Parallel</td>
<td>Other</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Are placed on the horizon</td>
</tr>
<tr>
<td>38</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Hilly</td>
<td>A mixture of 3 shapes</td>
<td>To mark an alignment between parts of the landscape</td>
<td>Have no relation to the horizon</td>
</tr>
<tr>
<td>39</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>Close to Stonehenge</td>
<td>Relation to other features</td>
<td>Hilly</td>
<td>A mixture of 3 shapes</td>
<td>N/A</td>
<td>Are a mix of on the horizon and not</td>
</tr>
<tr>
<td>40</td>
<td>Stonehenge</td>
<td>Stonehenge</td>
<td>N/A</td>
<td>Nothing or N/A</td>
<td>Gently Undulating</td>
<td>All different shapes</td>
<td>To mark a route through the landscape</td>
<td>Are a mix of on the horizon and not</td>
</tr>
</tbody>
</table>
### Part 4

**13- The Normanton Down Barrows are...**

<table>
<thead>
<tr>
<th>Participant</th>
<th>14- Describe the relationship between the two barrows to the left of the fence running towards Normanton Down</th>
<th>15- Describe the distribution of the Normanton Down Barrows</th>
<th>16- What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?</th>
<th>17- Describe the horizon around Stonehenge</th>
<th>18- Which is the closest to Stonehenge, Normanton Down or Cursus barrows?</th>
<th>19- Describe the distribution of the ancient man made things in the landscape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On elevated flat ground</td>
<td>One obstructs the view of the other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>2</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>3</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch matches the shape of the stones</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>4</td>
<td>On flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>5</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>6</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>7</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>8</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>9</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>10</td>
<td>On flat ground</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>11</td>
<td>On flat ground</td>
<td>One obstructs the view of the other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>12</td>
<td>On the side of a slope</td>
<td>One obstructs the view of the other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>13</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td></td>
<td>Location</td>
<td>Relationship</td>
<td>Spacing</td>
<td>Shape of Ditch</td>
<td>Presence</td>
<td>Grouping</td>
</tr>
<tr>
<td>---</td>
<td>------------------------------</td>
<td>------------------------</td>
<td>--------------------</td>
<td>-----------------------</td>
<td>--------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>14</td>
<td>On elevated flat ground</td>
<td>One obstructs the view of the other</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>15</td>
<td>On a ridge</td>
<td>One obstructs the view of the other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>16</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>17</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>18</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>19</td>
<td>On elevated flat ground</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Interrupted</td>
<td>N/A</td>
</tr>
<tr>
<td>20</td>
<td>On a ridge</td>
<td>One obstructs the view of the other</td>
<td>In a line</td>
<td>The ditch matches the shape of the stones</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>21</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>22</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>23</td>
<td>On a ridge</td>
<td>N/A</td>
<td>Unevenly spaced</td>
<td>The ditch matches the shape of the stones</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>24</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>They are the same distance</td>
</tr>
<tr>
<td>25</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Normanton Down Barrow group</td>
</tr>
<tr>
<td>26</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch matches the shape of the stones</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>27</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>There is no relationship</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>28</td>
<td>On elevated flat ground</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Interrupted</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>29</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>30</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>31</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>32</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Normanton Down Barrow group</td>
</tr>
<tr>
<td>33</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>34</td>
<td>On a ridge</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>35</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>Unevenly spaced</td>
<td>The ditch encloses the stone uprights</td>
<td>Acts as a boundary</td>
<td>Cursus Barrow group</td>
</tr>
<tr>
<td>36</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>37</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>In a line</td>
<td>The ditch matches the shape of the stones</td>
<td>Acts as a boundary</td>
<td>Normanton Down Barrow group</td>
</tr>
<tr>
<td>38</td>
<td>On the side of a slope</td>
<td>They are distant from each other</td>
<td>Spread out</td>
<td>There is no relationship</td>
<td>Continuous</td>
<td>They are the same distance</td>
</tr>
<tr>
<td>39</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>40</td>
<td>On the side of a slope</td>
<td>They are next to each other</td>
<td>Clustered</td>
<td>The ditch encloses the stone uprights</td>
<td>Continuous</td>
<td>Normanton Down Barrow group</td>
</tr>
<tr>
<td>4b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Frequency Tables

Please note, that due to the duplicated respondents for answers containing multiple categories of answer, the number of responses is increased for questions 2, 5 and 6.

1- What do you notice about the sizes of the Cursus Barrows?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Similar Sizes</td>
<td>20</td>
<td>50.0%</td>
</tr>
<tr>
<td>Different sizes</td>
<td>15</td>
<td>37.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

2- What do you notice about the location of the King Barrows?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>10.6%</td>
</tr>
<tr>
<td>On a ridge</td>
<td>16</td>
<td>34%</td>
</tr>
<tr>
<td>On the horizon</td>
<td>3</td>
<td>6.4%</td>
</tr>
<tr>
<td>Close to trees</td>
<td>10</td>
<td>21.3%</td>
</tr>
<tr>
<td>In a prominent location</td>
<td>2</td>
<td>4.3%</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>23.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>47</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

3- If you can, describe the distribution of the King Barrows

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>In a line</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>Equally spaced</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>Unevenly distributed</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Spread out</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
4- What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>The ditch surrounds Stonehenge</td>
<td>11</td>
<td>27.5%</td>
</tr>
<tr>
<td>They form concentric circles</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>They respect one another</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

5- Describe the relationship between the two barrows to the left of the fence running towards Normanton Down

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>10</td>
<td>23.3%</td>
</tr>
<tr>
<td>Same size</td>
<td>3</td>
<td>7.0%</td>
</tr>
<tr>
<td>Close together or attached</td>
<td>22</td>
<td>51.2%</td>
</tr>
<tr>
<td>One occludes the other</td>
<td>3</td>
<td>7.0%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>11.6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>43</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

6- Describe the horizon around Stonehenge

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>9</td>
<td>20.0%</td>
</tr>
<tr>
<td>High</td>
<td>4</td>
<td>8.9%</td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
<td>6.7%</td>
</tr>
<tr>
<td>Flat</td>
<td>3</td>
<td>6.7%</td>
</tr>
<tr>
<td>Undulating</td>
<td>15</td>
<td>33.3%</td>
</tr>
<tr>
<td>Has trees</td>
<td>8</td>
<td>17.8%</td>
</tr>
<tr>
<td>Has barrows</td>
<td>2</td>
<td>6.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
7- What do you think is the highest point in the landscape?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Stonehenge</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>Kings Barrows</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>East</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>North</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>South</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>West</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Bus stop</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

8- Describe the relationship of the road to the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Cuts through the landscape</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>Follows the contours</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Runs East-West</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Relation to other features</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Very visible</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Not very visible</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

9- Describe the terrain of the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Hilly</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Hilly</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>Gently Undulating</td>
<td>26</td>
<td>65.0%</td>
</tr>
<tr>
<td>Flat</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
10- The Cursus Barrows are...

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>All the same shape</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td>A mixture of 2 shapes</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>A mixture of 3 shapes</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>All different shapes</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

11- Describe the role of the Cursus in the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>To mark a route through the landscape</td>
<td>12</td>
<td>30.0%</td>
</tr>
<tr>
<td>To close off part of the landscape</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>To mark an alignment between parts of the landscape</td>
<td>13</td>
<td>32.5%</td>
</tr>
<tr>
<td>To serve as a boundary</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

12- The King Barrows...

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Have no relation to the horizon</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Are a mix of on the horizon and not</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Are placed on the horizon</td>
<td>25</td>
<td>62.5%</td>
</tr>
<tr>
<td>Are placed just below the horizon</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

13- The Normanton Down Barrows are...

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>On elevated flat ground</td>
<td>9</td>
<td>22.5%</td>
</tr>
<tr>
<td>On the side of a slope</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>On flat ground</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>On a ridge</td>
<td>17</td>
<td>42.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
14- Describe the relationship between the two barrows to the left of the fence running towards Normanton Down

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>They are distant from each other</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>They are next to each other</td>
<td>27</td>
<td>67.5%</td>
</tr>
<tr>
<td>One obstructs the view of the other</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

15- Describe the distribution of the Normanton Down Barrows

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>Spread out</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>In a line</td>
<td>10</td>
<td>25.0%</td>
</tr>
<tr>
<td>Clustered</td>
<td>6</td>
<td>15.0%</td>
</tr>
<tr>
<td>Unevenly spaced</td>
<td>18</td>
<td>45.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

16- What do you notice about the relationship between the stone uprights and the ditch of Stonehenge?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>5</td>
<td>12.5%</td>
</tr>
<tr>
<td>The ditch encloses the stone uprights</td>
<td>25</td>
<td>62.5%</td>
</tr>
<tr>
<td>There is no relationship</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>The ditch matches the shape of the stones</td>
<td>8</td>
<td>20.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

17- Describe the horizon around Stonehenge

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Interrupted</td>
<td>10</td>
<td>25.0%</td>
</tr>
<tr>
<td>Continuous</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Acts as a boundary</td>
<td>19</td>
<td>47.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
18- Which is the closest to Stonehenge, Normanton Down or Cursus barrows?

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td>Cursus Barrow group</td>
<td>30</td>
<td>75.0%</td>
</tr>
<tr>
<td>They are the same distance</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td>Normanton Down Barrow group</td>
<td>4</td>
<td>10.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

19- Describe the distribution of the ancient man made things in the landscape

<table>
<thead>
<tr>
<th>Response</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing or N/A</td>
<td>3</td>
<td>7.5%</td>
</tr>
<tr>
<td>Clustered in the South</td>
<td>1</td>
<td>2.5%</td>
</tr>
<tr>
<td>Clustered in specific areas</td>
<td>20</td>
<td>50.0%</td>
</tr>
<tr>
<td>Evenly distributed</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Only on high ground</td>
<td>7</td>
<td>17.5%</td>
</tr>
<tr>
<td>Only on flat ground</td>
<td>2</td>
<td>5.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Appendix 10- Collapsed Demographic Variable Crosstabulation

Due to the size of the output, the collapsed demographic variable crosstabulation can be found in Excel format on the accompanying DVD.

Appendix 11- Collapsed Log-linear Analysis

Due to the size of the output, the collapsed log-linear analysis can be found in Excel format on the accompanying DVD. In order to carry out the log-linear analysis 0.5 has been automatically added to the cell count of all cells. Cases out of range correspond to “Nothing or N/A” responses which have been excluded from the analysis.

Appendix 12- Collapsed Fisher’s Exact Tests

The Collapsed Fisher’s Exact Tests can be found in Excel format in the accompanying DVD. These tests were run on the original and duplicated participant responses. Not all questions had responses from the duplicates, and so the number of “valid cases” varies for each question.

Appendix 13- Additional Images

All RTI images used and additional images referenced in the text can be found on the accompanying Appendices DVD.
References


Beltran Lloris, M. (1972) Los grabados rupestres de Bedolina (Valcamonica), Bollettino del Centro Camuno di Studi Preistorici, Vol. 8, 121-158


LXIX


LXX


LXXI


LXXII


Du Halde, J-B (1709-1743) "Lettre du P. Jean Antoine Cantova, missionnaire ... au R. P. Guillaume Daubenton ... 20 de mars 1722. *Lettres Édifiantes et Curieuses, Écr rites des Missions Étrangères, par Quelques Missionnaires de la Compagnie de Jésus*, Paris


ERA: England’s Rock Art (no date) http://archaeologydataservice.ac.uk/era/ [Accessed 20th May 2018]


LXXVII


LXXX


LXXXII


LXXIII


LXXXIV


LXXXVI


Kaushik, N. (2014) Interpretation of Log Linear Analysis
https://groups.google.com/forum/#!msg/dataanalysistraining/VABJQNFvcoA/UFep30pK3-EJ
[Accessed 2nd September 2018]


LXXXVII


von Kotzebue, O. (1821) *A Voyage of Discovery into the South Sea and Beering's Straits ... in the Years 1815-1818*, London: Longman, Hurst, Rees, Orme and Brown


LXXXVIII


XC

*Proceedings of the National Academy of Sciences of the USA*, Vol. 97(8), 4398–4403


XCI


XCIII


Chauvet-Pont d’Arc, Ardèche, France. *Proceedings of the National Academy of Sciences of the United States of America, Vol. 113 (17), 4670-4675*


Rubin, E. (1915) *Sysoplevede Figurer*, Copenhagen: Glyndendalska


XCVIII


Tylor, E. B. (1871) *Primitive Culture*, London: John Murray


Social Spaces: Interdisciplinary Approaches to the Interpretation of Prehistoric and Historic Built Environments, Berlin: De Gruyter, 115-134


CVI