CHAPTER 1

Introduction

> *"…ultimately all human culture and society is based upon and only made possible by biological and economic viability…"*
>
> Higgs and Jarman 1975: 2

In 1975 Eric Higgs and Michael Jarman laid out their manifesto for 'palaeoeconomy' as a specific approach to archaeological research. They were cognizant that the fully integrated study of social, demographic, ecological, technological and economic aspects of human communities was the ideal way to proceed, but argued that, in order to comprehend human cultural 'peculiarities', it was necessary to have a sound understanding of biological and economic influences. They also pressed the point that advances in science, in conjunction with a ubiquity of appropriate evidence, allowed for the very effective study of environment and economy, whilst archaeological methods dealt 'ineffectively or not at all' with many other aspects of human behaviour. They aimed to concentrate on 'predictable laws of human behaviour' (Higgs and Jarman 1975). This school of thought became intertwined with the 'New Archaeology', developed on both sides of the Atlantic by scholars such as Kent Flannery, David Clarke, Lewis Binford and Colin Renfrew (Trigger 1989; Johnson 1999), but it really had separate and earlier origins in Graham Clark's focus on 'the economic basis' for prehistoric life, which began prior to the Second World War (Fagan 2001). This book aims to examine the development of economic archaeology, its major achievements, the views of its critics and its legacy, but above all it aims to take the best elements from that approach and update them in the light of new techniques and theoretical perspectives.

Authors of textbooks on archaeological theory (e.g. Trigger 1989; Johnson 1999; Renfrew and Bahn 2012) almost inevitably, given the format of a book, outline theoretical paradigms sequentially; they describe the

transition from antiquarianism to culture history and, post-war, the rise of functionalism, the New Archaeology and processual approaches, followed by post-processual and relativist ways of thinking. Our basic teaching of undergraduate archaeological theory largely follows the same pattern and it is all too easy to over-simplify that history as being a sequence of replacements. Of course, the real situation is much more complex and all of those approaches are still actively applied within modern archaeological research. The prevalence of different theoretical perspectives certainly varies geographically, but all are still practised, hopefully in dialogue with each other, but often also in unreconciled parallel. The heyday of the Cambridge-based palaeoeconomy school of thought generated many influential environmental archaeologists and their international diaspora has resulted in further generations of influential scholars still heavily influenced by foundations laid by Clark and Higgs.

The 1980s and 1990s saw considerable criticism of over-reliance upon universal, deterministic laws of behaviour that denied individual agency and the role of cultures (e.g. Hodder 1986; Thomas 1991). Few economic or environmental archaeologists, however, 'converted' to post-processualism, but they did take to heart some of the criticism. What resulted, in many cases, was research that attempted to 'move beyond protein and calories' (Russell 2012: 1) to deal with 'social' aspects of food procurement and consumption (e.g. Palmer and van der Veen 2002; O'Day, van Neer and Ervynck 2004; Overton and Hamilakis 2013). This line of research is a welcome addition to the practice of environmental archaeology. However, this book is not simply concerned with moving beyond matters of subsistence and economy, but in reconsidering the value of economic archaeology and the powerful role it can still play in interpreting past human behaviour. It is not the case that the economic basis for past human societies has already been fully understood and, given that any strict dichotomy between environment/economy and culture is fallacious, it remains as important as ever to gain a full understanding of it. There is bountiful evidence for the economic archaeologist to work with and its potential increases as scientific techniques develop. Subsistence needs to be put back into the study of past societies, but within a new, and more integrated, theoretical framework. There are exciting case studies of this kind of work, such as Marciniak's (2005) *Placing Animals in the Neolithic*, Halstead's (2014) *Two Oxen Ahead* or Sykes's (2014) *Beastly Questions*, which achieve an impressive balance of social, economic and scientific factors. This book aims to retain the significant achievements of the palaeoeconomy school, whilst revising aspects of its theoretical outlook and integrating new methodologies.

A plethora of significant new techniques have emerged since the 1970s, most of which relate to either biomolecular or microscopic evidence. In relation to biomolecular evidence, the extraction of ancient DNA (aDNA) first became possible in the early 1980s and by the middle of that decade it could be sequenced (Pääbo 1989). The first examples were based upon aDNA extracted from soft tissues, such as from museum specimens of the extinct quagga (Higuchi et al. 1984) and, of direct relevance to archaeology, an Egyptian mummy (Pääbo 1985). Extraction from bone started in the late 1980s, but robust precautions against contamination had really only developed by the late 1990s (Brown 2001). The field is, therefore, very young, but is now having massive impact on our understanding of domestication and colonization events, as well as population dynamics and the origins of particular phenotypes. Early archaeological use of stable isotope evidence to reconstruct aspects of human diet, initially levels of consumption of C_4 plants like maize, began in the late 1970s (e.g. Vogel and Van der Merwe 1977; Van der Merwe and Vogel 1978), but the field expanded massively from the 1990s to address much more complex questions of dietary reconstruction as well as issues such as origins and movement patterns of humans, plants and animals (Sealy 2001; Bogaard and Outram 2013). Isotopes have also played a key role in the development of lipid residue analysis. Whilst the molecular identification of certain organic residues in archaeological ceramics dates back to the 1970s (e.g. Condamin et al. 1976), the method was revolutionized in the 1990s by the introduction of carbon isotope ratio mass spectrometry (Evershed et al. 1994), which allowed more accurate origins of residues to be determined, eventually including important commodities like milk (Dudd and Evershed 1998). Since then, determination of hydrogen isotope ratios (e.g. Outram et al. 2009) has facilitated consideration of climatic and seasonal signals. Protein residue analysis techniques, initially based upon immunoassay, also developed during this same period (Gernaey et al. 2001; Smith and Wilson 2001), at first suffering, like early aDNA work, from issues of contamination and diagenesis, but also from cross-reactivity. The momentum in protein analysis now seems to have shifted towards mass spectrometry-based analyses such as ZooMS that allows for species recognition from collagen peptide 'fingerprinting' or 'barcoding' (Buckley et al. 2010, 2014; Collins et al. 2010).

The analysis of microscopic evidence, such as pollen, was already a long-established technique when the palaeoeconomic approach developed, but, of course, such methods have continued to be refined. However, there are also new classes of microscopic remains of economic significance now being routinely researched, such as phytoliths and starch grains. Whilst

phytoliths were known about as far back as 1900, their regular study in American archaeological contexts did not take off until the late 1970s (Pearsall 2000). Starch grains have also been known about since the early 20th century, but their regular study in archaeobotany commenced in the 1980s (Piperno and Holst 1998). The great significance of these two new lines of evidence is that they open up to study a vast range of economically significant plants that otherwise happen not to produce macrofossils likely to preserve well through charring or desiccation, such a tubers (Iriarte 2007). They have had a revolutionary effect upon our understanding of past plant use and domestication in the Americas and tropical regions, but remain, perhaps, under-utilized in Europe.

Whilst the study of phytoliths and starch grains developed largely within the discipline of archaeology, the same is not true for the biomolecular techniques. Early practitioners of these techniques tended to be based in either biology or chemistry departments; indeed, many leading research groups in these fields still are. Of course, excellent research is continually being produced through appropriate multi-disciplinary collaborations and many archaeology departments have brought biomolecular specialists into their fold. However, many biomolecular methods were developed outside the discipline and, in some cases, technical capabilities have forged ahead more quickly than appropriate interpretative frameworks. This book aims not only to update the canon of techniques available to palaeoeconomic research, but also to provide appropriate theoretical frameworks for their application alongside established techniques. This involves comparing and contrasting the site formation processes, taphonomy and quantification of each type of evidence, as well as highlighting the interpretative assumptions being made. Fortunately, weaknesses in one type of evidence are frequently strengths in others, offering fruitful ways forward.

The Origins and Development of Economic Prehistory

Grahame Clark was awarded his doctorate, entitled 'The Mesolithic, Neolithic, and Early Metal Age Industries of Britain' in 1934, and his many references to the work of pollen specialist Harry Godwin (Fagan 2001) already displayed an increasing awareness of environmental context. It was also in 1934 that geographer, ethnologist and sometime archaeologist, C. Daryll Forde published his highly influential volume *Habitat, Economy and Society* (Forde 1934). The vast majority of Forde's volume is dedicated to summarizing ethnological research regarding a series of pre-industrial peoples from around the world, but what is interesting is that

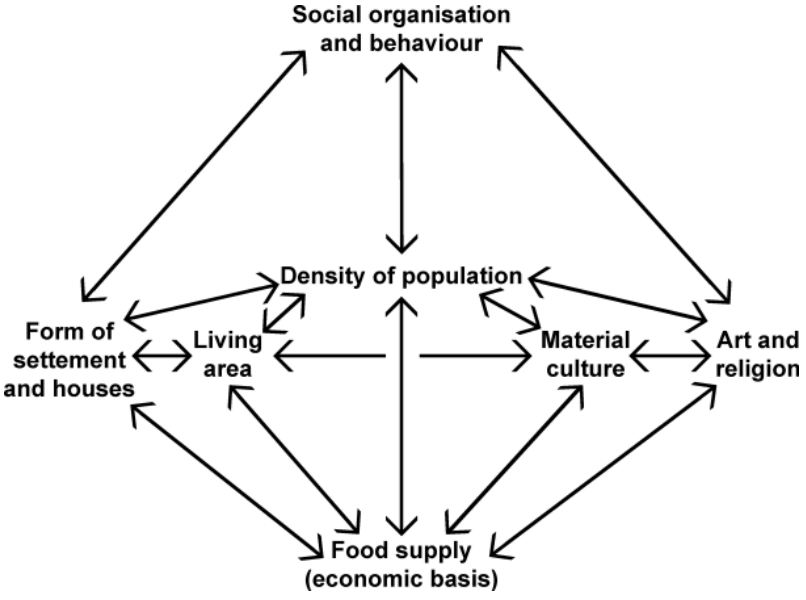

FIGURE 1.1 Clark's 1939 model from *Archaeology and Society* depicting the relationship between economic basis and other key factors of past society (after Clark 1939: 152).

they are divided into groups according to their mode of subsistence and there is a keen interest in their ecological setting. The volume concludes with generalized discussion of hunter-gatherers, pre-industrial farmers, pastoralists and the origins of domestic plants and animals. This discussion pays some considerable attention, in theoretical terms, to the relationship between environmental context, mode of subsistence and their interplay with human cultural agency. Forde is not often cited directly by Clark, but his work contributed significantly to the academic zeitgeist at a time when scientific approaches to archaeology were increasing.

By 1939, Clark had published the methodological work *Archaeology and Society: Reconstructing the Prehistoric Past*, which specifically considered food supply and the 'economic basis' of prehistoric peoples (Clark 1939: 152) and included a diagram modelling the interrelationships between economy, demographics, social organization, settlement and material culture (Fig. 1.1). This is an interesting emerging line of thought within the volume, but not a particular focus, as the book broadly covers other aspects of archaeological method in much more detail. Only later, revised editions of the volume contain a full chapter dedicated to economic reconstruction, based upon archaeological evidence, ethnographic

parallels and palaeoenvironmental context (Clark 1957). It was in the post-war years that Clark more particularly focused upon economy and, after writing a series of subsistence-related papers (e.g. Clark 1942, 1947a, 1947b), he published *Prehistoric Europe: The Economic Basis* (Clark 1952) in the same year that he was appointed to the Disney Chair at Cambridge (Fagan 2001). This survey of prehistoric subsistence evidence in Europe expanded considerably upon earlier economic works, but also added the notion of progressive 'economic stages' (Clark 1952: 7) and the proposition that significant adjustments, indeed advancements, in economic systems occurred at times of environmental 'disequilibrium'. In this way, economic and environmental approaches to archaeology were presented as capable of considerable explanatory power. The following year, in addressing the British Academy, Clark outlined a specific 'economic approach to prehistory' (Clark 1953) which, by way of conclusion, he recognized was only one of many potential approaches, and not one that provided answers to all questions, but he noted that 'the influence of economic factors permeates all levels of social life'. The Star Carr excavation report, an exemplar case study of such an approach, followed the next year (Clark 1954).

Perhaps not everybody recognizes 'palaeoeconomy' as a major, independent school of archaeological thought, but there is a strong argument that by the 1970s, that is what it had become. Clark certainly did not limit himself to economic approaches alone and addressed a very wide range of prehistoric research questions; by the 1960s he was championing 'world prehistory' (Clark 1961). However, the concept of economic prehistory was being adopted by others and there was the start of a diaspora of Cambridge alumni to other regions of the world, who were schooled in that way of thinking (e.g. Nenquin 1961). The apex of the palaeoeconomy school within Cambridge, however, centred around the granting of a British Academy Major Research Project entitled 'The Early History of Agriculture' in 1966 (Clark 1972a). To direct this project, Clark and his management committee turned to Eric Higgs. Higgs was an experienced hill-farmer who had worked as a research assistant in Cambridge since 1956. He had a keen interest in human–animal interactions in prehistory and had field experience in the UK (Hurst Fen), Greece (Nea Nikomedia) and the Middle East (Cyrenaica, Iran) and led the project from its start until his death in 1976 (Clark 1989). Higgs, perhaps more than anybody, is associated with palaeoeconomy as a specific movement within archaeology and the group of researchers and students who surrounded him, during the heyday of the Early History of Agriculture project, generated a rich vein of new methodologies and evidence that created a step change in the field.

Whilst the diaspora of economic prehistorians had begun under Clark, the spread of this project's associates to teaching positions around the UK and internationally had a dramatic effect upon archaeological science and the way it interacted with environmental sciences and anthropology.

Michael Jarman was appointed as assistant director of the project (Clark 1989), whilst Heather Jarman was its secretary and Sebastian Payne an associated British Academy Fellow (Higgs 1972). From the start, the project involved research associates and collaborators at a number of other institutions, such as Claudio Vita-Finzi at University College London, Jane Renfrew at the University of Sheffield, Derek Webley at the Agricultural Development and Advisory Service in Cardiff (Clark 1989) and Gordon Hillman at the University of Reading (Higgs 1972). Within Cambridge, the post-graduates associated with Higg's group included names that would later prove very influential, such as Robin Dennell, Tony Legge, Derek Sturdy, Paul Wilkinson (Clark 1989) and Geoff Bailey (Jarman et al. 1982). Some other key figures at Cambridge to be heavily influenced by the palaeoeconomy school were Andrew Sherratt, Clive Gamble, Paul Halstead and Peter Rowley-Conwy, who were undergraduates at the height of the project, and John O'Shea, Glynis Jones and Marek Zvelebil who came to Cambridge as doctoral students.

The impact of the project and 'palaeoeconomy' went far and wide beyond Cambridge, and by the 1980s, it is arguable that the source of academic momentum for palaeoeconomy had shifted to the Department of Archaeology and Prehistory at the University of Sheffield. During that period Sheffield was home to Graeme Barker, Robin Dennell, Paul Halstead, Glynis Jones and Marek Zvelebil. With that skills base it obviously followed that the Department would become a centre for education relating to environment and economy in prehistory. The MSc in 'environmental archaeology and palaeoeconomy' was born and still runs. Particularly through the late 1980s and 1990s it trained a hugely significant proportion of currently active environmental archaeologists, including the authors of this book. Below, the major academic achievements of the palaeoeconomy school are outlined, but that movement's effects on the education of environmental archaeologists and bioarchaeologists, at Cambridge, Sheffield and more widely, should not be underestimated.

Key Legacies of the Palaeoeconomy School

To discuss only the outcomes of the specific British Academy project, in terms of the legacy of the palaeoeconomy school of thought,

would be much too limiting. However, since there are still many active palaeoeconomists, of the first, second and third generations, some limits must be applied. It seems most appropriate to outline the principal achievements of palaeoeconomists from the end of the Second World War to the late 1980s, when post-processualism was gaining traction (e.g. Hodder 1986) on the one hand, whilst developments in the biological and physical sciences were about to herald new revolutions in bioarchaeology. Another way of looking at this is to think about the major advances made by palaeoeconomists from studying long-standing forms of physical evidence such as plant macrofossils, pollen, soils and faunal remains in the days before theoretical challenges from within archaeology and biomolecular advances from outside the discipline.

Since the early history of agriculture was the focus of the original project, this seems the best place to start. The British Academy project itself resulted in three edited volumes, *Papers in Economic Prehistory* (Higgs 1972), *Palaeoeconomy* (Higgs 1975) and, published after Higgs' death, *Early European Agriculture: Its Foundations and Development* (Jarman et al. 1982). The first of these volumes was divided off into three sections dealing with theory, methods and case studies (Higgs 1972). Perhaps the most striking aspect of the theoretical section is the careful consideration of territories, in an environmental and economic sense, with consideration of human mobility and change over time (Higgs and Vita-Finzi 1972). These considerations, of course, once many more data were available, became central to understanding the relationship between the origins of agriculture in the Near East and the detailed sequence of vegetation change through the late Pleistocene (see Hillman 1996). However, 'site catchment analysis', the specific application of these considerations to individual archaeological sites to understand 'the relationship between technology and those natural resources lying within economic range' (Vita-Finzi and Higgs 1970: 5), also became something of a hallmark of palaeoeconomic studies (see Fig. 1.2).

Site catchment analysis features in the case studies section of the first volume in relation to the Neolithic site of Tell Gezer (Webley 1972). This early application of the method considers also modern land use by traditional farmers and, hence, adds an ethnological aspect, as well as considering the evidence for environmental change within prehistoric periods. In the second project volume, exceptionally detailed use is made of site catchment analysis to elucidate settlement patterning in prehistoric Italy by both Barker (1975) and Jarman and Webley (1975), whilst Dennell and Webley (1975) applied the method to southern Bulgaria. This book concludes with appendices on how to carry out site catchment

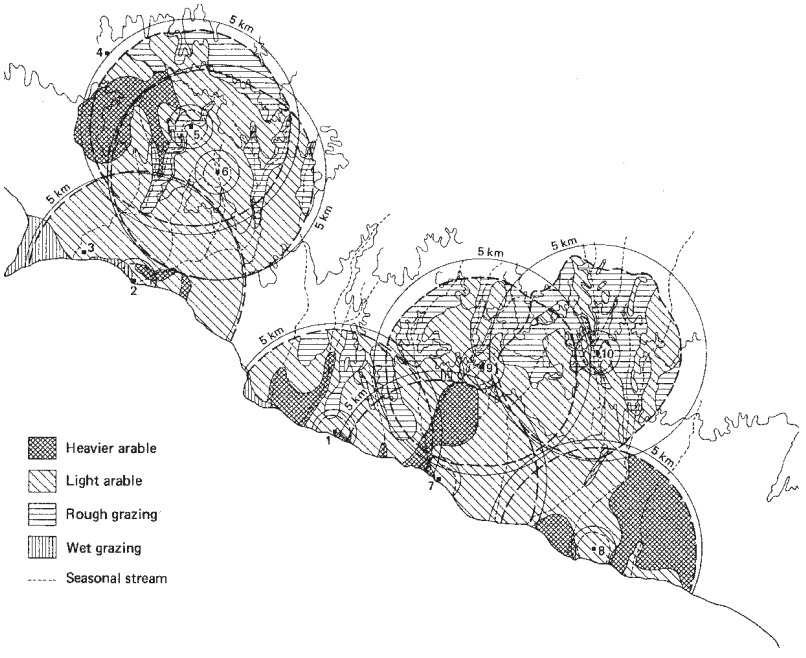

FIGURE 1.2 Site catchment analysis of a series of late Neolithic and early Bronze Age sites from central Macedonia: 1 Nea Kallikratia; 2 Kritsana; 3 Apanomi C; 4 Playiari; 5 Mesimeriani Toumba; 6 Mesimeri; 7 Veria; 8 Phloyita; 9 Nea Syllata; 10 Neo Triglia. Outer solid-line circles represent 5 km radius whilst dashed lines represent territories that could be walked within one hour. The 'one hour exploitation territories' are characterized by land type (reproduced with permission from Jarman et al. 1982: Fig. 60).

studies (Higgs 1975: Appendix A). Such analyses, and the more general mapping of geographical zones by economic potential, contributed very significantly to our understanding of the spread of farming societies within Europe and elsewhere. A clear example of the use of such an approach are the extensive palaeoeconomic discussions of the relationship between *Linearbandkeramik* (LBK or Linear Pottery Culture) settlement patterning and loess soils in Central Europe (e.g. Clark 1952; Barker 1985), a pattern first observed by German archaeologists (Buttler and Haberey 1936). Such observations regarding the ecological zones targeted by early farmers led to important new models for how colonization by farmers, or the adoption of agriculture by indigenous hunter-gatherers, may have proceeded. Simple models such as the 'wave of advance model' (Ammerman and Cavalli-Sforza 1973) were being challenged by more nuanced models, such as the 'pioneer colonization model' (Dennell 1985) that allows for selective

colonization of fertile regions, delayed adoption of farming in areas sub-optimal for agriculture and continued occupation of some enclaves by hunter-gatherers. The 'availability model' (Zvelebil and Rowley-Conwy 1984, 1986; Zvelebil 1986) extends these principles further to consider a blurred boundary between farming and hunter-gathering where, between the two extremes, there are areas where agriculture is being adopted, the 'substitution phase', and regions where hunter-gatherers are in contact with farmers, known as the 'availability phase' (Fig. 1.3). During the availability phase the fundamental subsistence base has not yet changed, but the contact between groups inevitably has both social and economic implications, as later discussed in detail by Zvelebil (1998).

The final project volume (Jarman et al. 1982) features site catchment analysis on its cover and almost ubiquitously throughout. By the late 1970s, site catchment analysis was also gaining traction within America (Roper 1979) with leading 'New Archaeologists' such as Kent Flannery (1976a, 1976b) making significant, if not uncritical, use of the technique. One can have endless arguments over how best to undertake site catchment analysis, technically, or how to interpret the information gleaned, theoretically, but few would disregard the concept entirely, and viewing a site within its immediate environmental surroundings is now a routine aspect of archaeology.

The methodological section of *Papers in Economic Prehistory* (Higgs 1972) is quite heavily concerned with improving the recovery of environmental remains through such techniques as 'froth flotation' with chemical additives to improve retrieval of charred plant remains (H.N. Jarman et al. 1972) and understanding the biases caused by a failure to screen for small bone fragments (Payne 1972a). Clearly, an issue facing the new palaeoeconomy movement was the fact that most earlier excavations had not employed the techniques necessary to recover, or fully recover, the key forms of evidence they were interested in. The problem was particularly acute for the advancing environmental archaeologists, because, whereas ceramics specialists might happily be able to visit old museum collections of pottery and make good use of them, providing the provenance was sound, environmental specialists would need to carry out new fieldwork to make real progress. Two individuals associated with the British Academy project, Tony Legge and Gordon Hillman, saw their chance to do just that at Tell Abu Hureyra situated on the middle Euphrates in Syria. They joined with Andrew Moore to begin their own excavations on this important site, which spanned the critical periods from the Epipalaeolithic through to the ceramic Neolithic (Moore et al. 2000). This team's campaign of excavations