Introduction

The transition from hunting and gathering to agriculture represents a shift from hunting and gathering to farming, from food collection to food production, from the wild to the domestic, and marks the beginning of most of the significant developments in human society—the appearance of social inequality and the rise of states. For this reason, the origins of agriculture have been the subject of intense research and debate for more than a century. It might seem that examination of this transition would include a logical emphasis on changes in subsistence, and that is true to a certain degree. However, the use of the idea of subsistence is radically different when it is applied to the hunter-gatherers on one side of the transition and when it is applied to farmers on the other.

Ethnographers have long been amazed by the knowledge that hunter-gatherers have about their environment, including extremely detailed information about plant and animal species, geography, and subsistence alternatives. This knowledge is often used to locate resources, using what seem to non-foragers to be
elusive clues (Lee and DeVore 1968). Over the last few decades, anthropologists have considered how hunter-gatherers make decisions about where to camp, rest, or find food with a variety of ecological models derived from evolutionary theory (see examples in Winterhalder and Smith 1981; Smith and Winterhalder 1992). These approaches attempt to link the decisions made by hunter-gatherers to features of the environment such as resource abundance, predictability, and distribution in space. These kinds of approaches to subsistence have been emphasized in studies of the Mesolithic, the time of the last hunting and gathering peoples in Europe.

Such models have also been used in an attempt to understand the origins of agriculture. A recent example, presented by Richerson, Boyd, and Bettinger (2001), attempts to explain why agriculture did not emerge during the Pleistocene. They argue that agriculture was impossible during the last glacial period because of climatic instability, and that the adoption of agriculture in the Holocene was not optional. Their explanation examines the transition to agriculture at the global scale and presents climatic change as the primary factor in the appearance of agriculture. In contrast, most recent approaches question the treatment of agriculture as a single phenomenon and consider specific regional or local sequences of change as the more appropriate scale of analysis.

Early agricultural systems involved a variety of species, technologies, and environments and were associated with different types of social and economic systems. In fact, it is frequently argued that the adoption of agriculture had very little to do with subsistence (Tilley 1996; Price 2000b). In the last decade, it has been proposed that the transition to agriculture must be understood not as an economic adjustment, but as a cognitive or symbolic transformation that redefined human self-awareness. This perspective has been
especially influential in studies of the Neolithic of northwestern Europe (Hodder 1990; Thomas 1991; Tilley 1996; Whittle 1996). These approaches have frequently used the metaphor of domestication in an attempt to understand the ideological changes that are considered important in the transition to agriculture. While the concept of domestication is usually applied to the plants and animals used by farmers, these authors argue that people and the landscape must be domesticated before they can become farmers. This process of domestication is described as a fundamental change in the way that people who are adopting farming view nature and its relationship to culture.

The result of these trends has been a disciplinary segregation of researchers into those who study hunter-gatherers on one side of the transition and those who study farmers on the other. In northwestern Europe, many scholars who study the last hunter-gatherers of the Mesolithic emphasize ecological approaches, whereas those scholars who are interested in the first farmers of the Neolithic present ideological accounts. This division creates unnecessary difficulties in the examination of this process of critical anthropological significance. This paper addresses the issues surrounding the disparate uses of the concept of subsistence in the study of the transition from hunting and gathering to farming in northwestern Europe. An attempt will be made to present theory that can accommodate both the practical and symbolic importance of subsistence practices within a broad social context linking settlement patterns, technology, and ritual. The potential use of such theories has implications for the use of both models and metaphors in the attempts of archaeologists to explain, interpret, and understand the past.
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This section presents a brief summary of the major features of the Mesolithic and Neolithic in Europe. An attempt has been made to reduce the complexity of culture names and artifact types that are used by archaeologists to describe these two broad periods of time bracketing the transition to agriculture. To simplify the chronology for non-specialists, calibrated radiocarbon dates in BC have been used. A more detailed examination of these periods can be found in a recent summary of European prehistory edited by Milisauskas (2002).

The Mesolithic is the period of the last hunter-gatherers in Europe. It is defined as beginning at the end of the last Ice Age and as ending with the adoption of farming. Although research on the Mesolithic has been continually increasing over the past thirty years, it is still overcoming the perception of being an uninteresting period of time between the cave painters of the Paleolithic and the farmers of the Neolithic (Rowley-Conwy 1986). The beginning of the Mesolithic is arbitrary, and the date 8000 BC, corresponding with the traditional boundary between the Pleistocene and the Holocene, is frequently chosen (Price 1987; Mithen 1994). There is no clear separation in the archaeological record between the behavior of Paleolithic and Mesolithic hunter-gatherers. The division between the Mesolithic and the Neolithic is just as unclear. The use of pottery, sedentism, and complex social organization were once thought to be the sole domain of Neolithic populations. All these features are now known to appear in the Mesolithic. If the end of the Mesolithic is viewed as coinciding with the adoption of agriculture, then it varies from before 7000 BC in southeastern Europe to after 5500 BC in the northwest.
The period from 8000 to 5500 BC was warmer than the preceding Late Pleistocene. It was associated with the spread of forests after the retreat of the glaciers. Gradually, mixed forests of birch and pine were replaced by hazel, oak, and elm. Red deer, roe deer, wild pig, aurochs, and elk replaced reindeer and horse as the primary game animals pursued by hunters. Rising sea levels reached the modern coastline around 5000 BC, and from that point on, most archaeological sites on the coast contain evidence for some reliance on marine resources such as sea mammals, fish, and shellfish.

It is clear that a wide range of foods from the land, sea, and air were available to Mesolithic hunter-gatherers. Resource procurement became both more specialized and diverse: specialized in terms of the technology and economic organization, and diverse in terms of the number of species and types of habitats exploited. The use of certain resources, particularly nuts and shellfish, becomes much more visible in the archaeological record of the Mesolithic, but these represent greater variety in the diet rather than a fundamental change in the staple food. The additions to the diet generally come from lower in the food chain and require more complicated processing techniques. This is commonly argued to represent the intensification of subsistence activities (Zvelebil 1989).

The Mesolithic provides the first good evidence for the inclusion of plant foods as an important part of the diet (Price 1987, 1989; Zvelebil and Rowley-Conwy 1984, 1986; Zvelebil 1994). In some parts of Europe, huge quantities of hazelnut shells are found in archaeological sites. However, the vast majority of known Mesolithic sites are open-air camps that lack preserved organic materials. Most of the known sites, probably over 90%, are scatters of stone artifacts on the ground surface (Jochim 2002). Many of these sites are the results of repeated occupations over long periods of time. These characteristics place strong limits on the
interpretations that archaeologists can apply to the Mesolithic, but the overall picture is one of small, highly mobile groups of people at the beginning of the period with the later appearance of larger, more sedentary groups, especially on the coast.

In sum, the Mesolithic represents a period of adjustment to the increasing forestation of the European continent. The diets of hunter-gatherers showed increasing diversification, incorporating a greater variety of large- and small-game animals, birds, fish, and shellfish. As the forest spread, plant foods became more abundant and were included in the diet in varying amounts. Many of these new foods probably required more labor to procure and process. These gradual changes in subsistence were closely linked to other changes in human behavior. During the Mesolithic, a fantastic array of technological innovations was developed to take advantage of the available food sources. These include pottery, fish traps, bows, and plant-processing tools. In this sense, the Mesolithic archaeological record of Europe presents a set of connected problems concerning technological, economic, and social change. Many of these changes set the stage for the adoption of agriculture.

In most of Europe, the Neolithic is the time period defined as starting with the first appearance of agricultural communities and ending with the appearance of bronze metallurgy that marks the beginning of the subsequent Bronze Age (Milisauskas 2002). What archaeologists label as Neolithic societies appeared in southeast Europe between 7000 and 5500 BC, in central Europe at about 5500 BC, and ultimately in northwest Europe around 4000 BC (Whittle 1996). The Neolithic can be defined as lasting until about 3000 BC in southeast Europe and until about 2500 BC in the rest of the continent.

The appearance of farming across Europe is traditionally associated with a cultural package of pottery, ground stone axes,
and monument construction. However, the relationship between
agriculture and the Neolithic is not as obvious as was traditionally
thought. The archaeological record shows significant variability
between regions in terms of the timing of change and the type of
economy that appears. The transition to agriculture is a complicated
process that involved the spread of new people, the spread of new
concepts, and innovations by the Mesolithic hunter-gatherers. In
some areas, the first farmers were sedentary, with cereal crops and
domesticated cattle, pottery, and ground stone axes. This is the classic
Neolithic package that was once thought to characterize the
continent as a whole. In other places, especially in northwestern
Europe, the early Neolithic seemed to have much in common with
the hunter-gatherers of the Mesolithic.

It is important to keep in mind that most of the major
innovations seen in the Neolithic came initially from Asia (Price
2000). The staple crops and animals used in the European Neolithic
include various wheat species, barley, flax, cattle, pigs, sheep, and
goats. With the exception of pigs, these plants and animals were
most likely initially domesticated in the Near East sometime after
10,000 BC. As agricultural practices spread throughout Europe, these
plants and animals came to be included in the subsistence practices
of people across the continent.

Traditionally, the introduction of agriculture into Europe
was thought to reflect a migration of farmers using ceramic
containers and domesticated plants and animals, and building
permanent villages along with new monumental architecture (Childe
1925). It was thought that the Mesolithic hunter-gatherers, assumed
to be present in small numbers, were overwhelmed by the appearance
of these new colonists. A trend for radiocarbon dates of the earliest
Neolithic to decrease in age from southeast to northwest across the
continent of Europe was correlated with the spread of material
culture to describe the process as a “Wave of Advance” (Ammerman and Cavalli-Sforza 1973). This model has been the foundation for discussion of the transition to agriculture for more than a quarter of a century.

Recent debate over the transition to agriculture has involved a steady stream of new fieldwork, new methods, and new concepts. Questions have arisen about the contents of the Neolithic cultural package, the exact nature of farming techniques, the role of the Mesolithic hunter-gatherers, and the causes of the transition. These questions have resulted in a bewildering array of redefinitions of the Neolithic. The Neolithic has been thought of as a time period, an evolutionary phase, a population, a mode of production, and most recently, as an ideology (Thomas 1991; Whittle 1996). It is now clear that a number of traits traditionally associated with the Neolithic appear in the Mesolithic in some areas, including pottery, sedentism, the use of plant foods, and the use of cemeteries (Schulting 1998). Most authors now accept the idea that local populations of Mesolithic hunter-gatherers played an important role in the transition to agriculture.

One of the most recent trends in redefining the Neolithic of Europe has emphasized its symbolic aspects. This perspective downplays the role of subsistence in the transition to agriculture and emphasizes the transfer of ideas, symbols, and perceptions (Hodder 1990; Thomas 1991; Bradley 1993; Tilley 1996; Whittle 1996). This has been an extremely influential perspective in northwestern Europe, and new interpretations of the Neolithic based primarily on discussions of the meaning of various monuments have been dominant in the literature of the last decade. These approaches apply a variety of theoretical techniques to investigate the local histories of the adoption of agriculture in parts of northwestern Europe, especially in southern Scandinavia and
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Britain. The main feature of these approaches is the use of the concept of domestication as a metaphor for many of the conceptual changes that are associated with the transition to the Neolithic. Domesticated plants and animals are a major feature of the traditional Neolithic cultural package, and are usually associated with farming as a mode of subsistence. The transformation of the Neolithic from a cultural package that uses domesticated plants and animals for subsistence to the Neolithic as a way of thinking that revolves around the concept of domestication represents a radical change in concerns about the role of subsistence in the transition from hunting and gathering to farming.

The interpretative approaches recently applied to the Neolithic contrast dramatically with the majority of theoretical approaches applied to the Mesolithic in terms of the conception of subsistence. Ecological models concerned with how hunter-gatherers make decisions about what to eat dominate accounts of the Mesolithic. Interpretative approaches concerned with how farmers think about the world through a variety of metaphors linked to domestication now dominate the Neolithic. These two kinds of approaches are often viewed as fundamentally opposed and reflect the greater divide in anthropology between scientific and humanistic approaches to human behavior.

Archaeologists have recognized for years that the division of prehistory into rigidly defined periods is not clearly reflected in the archaeological record (Armit and Finlayson 1992). Most researchers acknowledge the dynamic interdependence of the ecological and symbolic aspects of subsistence. An examination of the published proceedings of the Sixth International Conference on the Mesolithic in Europe, held in Stockholm in 2000, reveals that some scholars are attempting a more holistic approach to understanding the transition from the Mesolithic to the Neolithic.
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(e.g., Cummings 2003; Strassburg 2003). These holistic approaches can also be seen in the work of several scholars who have examined the role of Late Mesolithic people in laying the foundations for the transformation of the landscape later in the Neolithic, and who have given special attention to the ideological changes associated with the origins of megalithic monuments (Thomas 1988; Sherratt 1996; Bradley 1998a; Whittle 2000). In fact, the apparent dichotomy between interpretations of the Mesolithic and the Neolithic is largely a result of the historical development of the discipline of archaeology in Britain.

Grahame Clark, an innovator in the use of ecological approaches in archaeology, happened to work in the Mesolithic (Clark 1954; also see papers reprinted in Clark 1989), while Ian Hodder, perhaps the most influential postmodern thinker in archaeology, happened to work in the Neolithic (Hodder 1986, 1990). These two influential scholars and their students established the foundations for much of the current thinking about these two periods. With this historical picture in mind, it should be clear that this paper does not suggest that the current state of research only reinforces these traditional views. As mentioned above, most scholars recognize that any strict division between the Mesolithic and the Neolithic is artificial. However, much current research continues to recognize this important point only implicitly, without giving particular attention to how these traditional views can be reconciled to provide a more holistic view of the past.

This paper argues that such a division can only hinder an understanding of the transition to agriculture, a critically important process in human development. Therefore the purpose of the paper is not necessarily to characterize the current state of research, but rather to present some possible means to bridge the gap between the more extreme views of the Mesolithic and Neolithic. The
following sections present a further examination of the structure and goals of the models used in Mesolithic Europe and the metaphors used in Neolithic Europe. The argument is made that these two approaches are not as different in their applications as is commonly assumed. Two theoretical constructs are presented that could allow for a synthesis of these two approaches. If such synthetic approaches are applied to both sides of the transition to agriculture, then the result will be a better understanding of this fascinating process.

**The Mesolithic: models of subsistence and settlement**

Because the end of the Mesolithic is defined on the basis of a change in subsistence practices, subsistence forms a major focus of research within this time period. This research has primarily been conducted within the realm of evolutionary theory, and especially within the context of human ecology. Within this approach, the quest for food is regarded as directing and conditioning many aspects of human behavior, including group size and social organization, residence patterns and settlement location, tool manufacture and technology, and transportation. From this point of view, information about past diets has been used by archaeologists to identify patterns in the use of the landscape, the determinants of site locations, and the appearance of status differentiation in prehistoric human societies. However, there is little reliable information on subsistence practices and the composition of Mesolithic diets. Price has described the evaluation of prehistoric subsistence in the Mesolithic as “subjective and impressionistic” (1990:48). Existing evidence for subsistence comes from a number of lines of research: faunal analysis, paleoethnobotany, fecal studies, dental studies of tooth wear and the frequency of caries, physical anthropology, chemical analysis
of bone, ethnographic analogy, and quantitative modeling. All these approaches have been used in the Mesolithic, and this section will provide a brief review of some of the most important ones. The point to be demonstrated is that the majority of Mesolithic research emphasizes a view of subsistence as food-getting behavior.

Direct evidence of diet can be obtained in the form of preserved animal or plant remains in archaeological sites. There are numerous examples of the analysis of such evidence (e.g., Mellars 1978; Holden, Hather, and Watson 1995; Perry 1999). Useful summaries of such approaches are available in Price (1990) and Rowley-Conwy (1987). The details of such studies are beyond the scope of this paper. The important point is that these studies are often used to track changes in hunter-gatherer diets and to show that, over time, more resources are included in the diet. This is usually interpreted as a form of resource intensification (Zvelebil 1989). There is a general trend during the Mesolithic towards more labor being spent on acquiring food. This is often tied to the difficulties of finding food in the dense forests that grew in Europe after the end of the last Ice Age.

Frequently, the studies of animal bones are included in attempts to reconstruct the seasonal round that hunter-gatherer groups might have used in a particular area. Such attempts are based on the observation that ethnographically known hunter-gatherers use mobility to take advantage of seasonally available food resources. Based on his work among the Nunamiut of Alaska, Binford (1980) developed a model of hunter-gatherer mobility in which the mobility of groups can be characterized as falling somewhere on a spectrum between foragers and collectors. Foragers move their residential camps frequently in order to take advantage of available resources. Collectors have fewer residential camps and make frequent logistical trips to the locations of resources in order to procure them. This
model has been incredibly influential in archaeological studies of hunter-gatherers and is certainly the most frequently cited model that attempts to link the patterns of resource distributions with patterns of hunter-gatherer mobility. Examples of applications of this model can be seen at the famous Mesolithic site of Star Carr (compare Clark [1954] with the recent review in Carter [1998]). Such models link direct evidence of diet to other aspects of human behavior such as mobility patterns and settlement locations.

The study of the chemical composition of human bone also has the potential to provide direct evidence about diet. The ratios of carbon and nitrogen isotopes in the bone collagen of prehistoric humans can add to knowledge about preferred foods, nutrition, and the relative contribution of various foods in the diet (Price 1990; Richards and Hedges 1999). Several studies have examined the relative role of terrestrial and marine resources in Mesolithic diets by making assumptions about human diets on the basis of isotope studies of dog bones (Clutton-Brock and Noe-Nygård 1990; Day 1996). Such chemical approaches are only beginning to be applied and may have a significant effect on future discussions of prehistoric diet.

Indirect evidence about Mesolithic diet has been obtained by comparing dental pathologies between Paleolithic and Mesolithic hunter-gatherers (Frayer 1989) and by conducting usewear studies on stone tools (Dumont 1989). Frayer found that there was an increase in caries rates from the Paleolithic to the Mesolithic, and this difference is explained by the increased use of plant foods in the Mesolithic. Dumont found that some stone tools from this time period preserve evidence of the type of material they were used to work. Most tools show evidence for use in a variety of tasks, but the tools most directly involved in obtaining food, projectile points, have few indicators of usewear. Further work in these two areas

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Two further approaches that exemplify the examination of subsistence within an ecological framework are quantitative modeling and computer simulation. Both approaches are grounded in evolutionary theory and make the argument that human decision-making has been shaped by natural selection to result in a system in which choices are made that will, on average, increase the net return in energy by either maximizing the calories obtained from resources, or minimizing the calories spent on finding, obtaining, and processing food resources. The basic argument is that efficient food-getting behavior will increase the reproductive fitness of an organism. The decisions are made in an ecological context that has implications for what resources hunter-gatherers will use, when they will use them, and how they will organize their settlement system to take advantage of the resources available in a particular area. These types of modeling efforts are widespread in hunter-gatherer archaeology and anthropology and have been viewed by many as making useful predictions about how hunter-gatherers are expected to behave.

Although it was not developed strictly within the evolutionary ecology paradigm, perhaps the best-known quantitative model of Mesolithic subsistence is the work done by Jochim (1976). In this study, Jochim used certain characteristics of various food sources, such as weight, density, mobility, and non-food value to estimate their relative importance during the Mesolithic in southern Germany. Based on the reconstructed distribution of these resources, he presented a model in which he expected hunter-gatherer settlements to be located near lakes in the summer when fish, birds, and plant foods would have been abundant. Jochim expected that winter camps would be located in caves at higher
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elevation and that subsistence activities would focus on big game. At the time the model was developed, there was relatively little information about subsistence and season of occupation in southern Germany, but the model seemed to fit the available evidence. Jochim (1998) reported on twenty years of archaeological survey and excavation designed to find evidence to support or challenge the earlier model. Overall, the model fits the data well in the earlier part of the Mesolithic, but the predictions do not match as well for other periods.

Mithen (1990), working specifically with the realm of optimal foraging theory, has developed a model for hunting in the Mesolithic in the context of a computer simulation designed to examine the effects of hunter-gatherer decision-making on assemblages of animal bones. He argues that differences in archaeological assemblages of faunal remains might be explained by differences in the strategies of Mesolithic hunters. He compares the effects of models based on maximizing hunting efficiency, minimizing risk, and meliorating hunting efficiency. The simulated assemblages of animal bones are compared to archaeological assemblages in Denmark and southern Germany in an attempt to see which decision-making model best fits the available data. Mithen argues that one decision model fits Denmark while another fits southern Germany.

Quantitative models suggest interesting patterns for connections between subsistence systems and the resources available in particular environments. Although such models can appear very precise, they are based on a variety of assumptions and missing data. For example, large game is often assumed to be the focus of subsistence. The role of plant foods in the Mesolithic is often ignored. Estimates involved in defining the relationships between variables in such models are usually completely unverifiable given
the present state of knowledge about Mesolithic subsistence based on direct evidence of diet (Price 1990:49). While quantitative models are useful and informative, they do not provide reliable pictures of past subsistence practices.

Models are simplifications of reality that attempt to focus on the essential features of a problem and its proposed solution. Most attempts at modeling diet choice and its effects on other aspects of behavior have been criticized as overly simplistic, and the argument has been made that such models reduce humans to passive entities that are only capable of reacting to non-social forces (Hodder 1985; Shanks and Tilley 1987). Mithen (1989) has made a persuasive argument that these criticisms are based on misunderstandings of the applications of evolutionary theory and the goals of ecological modeling. The context of the use of ecological models in comparison to the use of more interpretative approaches will be explored further below.

The examples in this section illustrate the emphasis on a particular use of the concept of subsistence in the study of Mesolithic hunter-gatherers. In this usage, subsistence is treated broadly as food-getting behavior. In studies of the Mesolithic, subsistence is mostly examined in terms of the decisions hunter-gatherers made about what animals, and only rarely what plants, to eat. These decisions are understood within the framework of evolutionary theory, especially as formulated within evolutionary ecology, and subsistence is viewed as being intimately connected to, and sometimes the primary cause of, other human behaviors such as patterns of mobility and settlement locations. In sum, subsistence is viewed as the relationship between humans and the food resources in their environments. This view is extremely different from that seen in many recent studies of the Neolithic.
The Neolithic: metaphors of subsistence

Many of the approaches described above also appear in the context of the Neolithic. Isotope and dental studies have been applied to the study of the transition to agriculture in Europe (Lubell et al. 1994; Lillie 1996). Optimal foraging models have also been applied (Gregg 1988). Such studies continue to emphasize the view of subsistence as diet. However, the role of subsistence in the transition to agriculture has been dramatically reconsidered over the last few decades. Bender argued that “the enquiry into agricultural origins is not … about increased productivity, but about increased production and about why increased demands are made on the economy” (1978:206). Bender argued that food production was not really about food at all. Food production is about social relations—about the structures of political alliances and the individuals that create, maintain, and challenge such structures. Bender was one of the first scholars to call attention to the idea that the creation and maintenance of alliances through exchange gave rise to a demand for surplus production. Agriculture was adopted because it provided a means for producing food surpluses that came to be controlled by certain individuals of higher status who used this wealth in competition with other high status individuals. In sum, Bender argues that the adoption of agriculture was closely connected to the development of inequality and social hierarchy.

Indications of social inequality in the Neolithic of Europe come from several lines of evidence including differences in house sizes, the differential distribution of non-local materials, and the appearance of megalithic graves. The construction and content of the tombs suggests that these are burials of high-status individuals (Andersen and Johansen 1992). In addition to this evidence of social hierarchy, there are suggestions of a transition from production of
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various items for use to production for exchange in the Neolithic. This can be seen especially in the production and exchange of stone axes (Bradley and Edmonds 1993). Approaches with such social concerns are interesting because they do explain some of the phenomena associated with the appearance of the Neolithic, including trade in exotic materials, specialized production, and monuments. But evidence of status differentiation does not exist in all areas. Furthermore, such approaches beg the question: what led to the appearance of status differentiation in the first place?

Another influential set of approaches has emphasized the symbolic aspects of the Neolithic. In these approaches to the transition to agriculture, the importance is placed on the transmission of ideas, symbols, and perceptions. These approaches identify farming not only as a method of obtaining food for subsistence, but also as a significant symbolic construct. One of the most influential authors of this ideological perspective is Hodder (1990). Hodder uses domestication as a metaphor to build structural oppositions in the form of culture and nature, tame and wild, *domus* and *agrios*. He uses these structures to make a case for the domestication of people and communities before the domestication of plants and animals. He argues that an acceptance of the constraints of sedentary life and an associated shift in values and worldview must have accompanied the transition to agriculture. For Hodder, the house is the center of the concept of *domus* and the *domus:agrios* structural model uses a set of ideas derived from the concept of and everyday practice of living in and experiencing the house. As summarized by Whittle (1996:8), the house becomes “both a metaphor and a mechanism for the domestication and socialization of people.”

These metaphors are echoed in a number of publications (Thomas 1991; Tilley 1996; Whittle 1996). All three authors make a
case for the adoption of the Neolithic symbolic system with its material expressions in the forms of pottery, houses, polished axes, domestic plants and animals, and mortuary monuments by Mesolithic groups. The Mesolithic is seen as a time in which people emphasized their connection to nature. As a result of their exposure to ideas about domestication and the control of nature, they constructed monuments that represented their relationship to ancestors and the timeless past (Bradley 1993, 1998a). Domesticating the landscape by building monuments in places that were traditionally important in the Mesolithic and using structures that incorporated features of those natural landscapes within the monuments “restructured notions of time and space, death and the body, prestige and social competition” (Tilley 1996:73). The natural hunter-gatherers of the Mesolithic had to deal with the guilt associated with domestication and make cognitive and symbolic adjustments in their cultural systems before they could be integrated into the Neolithic system. These approaches emphasize the importance of social identity expressed through community ritual and agency-based approaches in which individuals interact with each other to create, maintain, challenge, and redefine their cultural environments. In sum, Tilley argues that:

The Neolithic was primarily not an economic phenomenon, nor a new set of social relations, nor the manifestation of an immigrant group, but the material manifestation of a new set of ideas restructuring Late Mesolithic societies and changing their social and economic conditions of existence. (1996:72)

This view, based on structural principles derived from the metaphor of domestication, provides an important alternative interpretation of the Neolithic and its possible meaning to the prehistoric people
of northwestern Europe. It is plausible that the building of monuments represented an enculturation of the natural landscape and that this represents an increasing awareness of the divide between nature and culture. The monuments contain the remains of the dead, the ancestors, and are placed on the landscape in a way that appropriates potent ancestral, natural places (Bradley 2000). This emphasizes a connection to the past and provides centers for community ritual that reinforce and maintain a new commitment to the domestication of humans and the environment.

Such interpretations often provide compelling narratives, but these approaches are very difficult to evaluate based on the archaeological record. Furthermore, they have been criticized by authors who recognize the dichotomy between nature and culture as a modern conception of the world (Bender 2000; Cummings 2002). Archaeologists are trained to see the difference between natural rock outcrops and human architecture, but other people do not see their world this way (Bradley 1998b). Australian aborigines, for example, think of all of the features of their environment as created by mythical beings during the dreamtime (Layton 1999; Smith 1999). Mythical ancestors constructed the world. Rather than seeing a dichotomy between nature and culture, the Neolithic people might have viewed their natural environment as constructed, and the building of megalithic tombs was a continuation or a re-creation of an ancestral tradition (Bradley 1998b). Also, such approaches fail to take into account regional variability. For example, such approaches would have trouble explaining how the transition to agriculture could take place in the absence of monuments, as in the case of southern Ireland (Woodman 2000).

In addition to these critiques, interpretative approaches fail to deal with the question of causality. Why would Mesolithic hunter-gatherers give up their successful way of life and its associated
worldview to become part of the Neolithic tradition? The ideological approach lacks a coherent theory to deal with how and why new ideas and symbols spread from farming communities to hunting and gathering communities. This leaves open the possibility that the change in subsistence does matter in the transition to agriculture. Surely, subsistence is important for both its practical and symbolic features. The transition to agriculture could be better understood if archaeologists on both sides of the hunter-gatherer and farmer divide made use of theory that could effectively link the functional and symbolic aspects of subsistence. Two suggestions are made for approaches that have the possibility of dealing with subsistence in a more integrated fashion.

**Integrating concepts: landscape**

In recent years, the topic of landscapes has appeared with increasing frequency in the archaeological literature (Rossignol and Wandsnider 1992; Bender 1993; Ashmore and Knapp 1999; Ucko and Layton 1999; Anschuetz, Willshusen, and Scheick 2001). Much of the literature concerned with the Neolithic has made use of this concept (Bradley 1993, 1998a; Tilley 1994). There have also been attempts to apply the concept to hunter-gatherer groups (Barton et al. 1995; Jochim 1998; Conneler 2000; Pollard 2000). This implies that a landscape perspective might have something to offer to those interested in an approach that can integrate studies of hunter-gatherers and farmers.

There seem to be as many different definitions of a landscape approach in archaeology as there are archaeologists attempting to apply this kind of research strategy. However, there are a few common themes running through many of the definitions. Feinman (1999) summarizes these themes well by suggesting three
critical facets of landscape approaches. First, these approaches involve a dedicated effort to examine the physical environment using a variety of natural science techniques. Second, these approaches include the recognition that human-environment relationships are constantly changing and are shaped by distinct cultural perceptions. Finally, landscape approaches include the realization that human environments are at least partly constructed by human behavior. This summary corresponds well with the suggestions by Anschuetz, Wilshusen, and Scheick (2001) that landscape approaches complement traditional archaeological uses of space and time while integrating human history and agency into their constructions. They define three main subcategories for landscape approaches: settlement ecology, ritual landscapes, and ethnic landscapes. In sum, landscape approaches focus on the reciprocal relationship between humans and their environment as this relationship is mediated by social relations and human perception.

With these key points in mind, it is worth emphasizing that landscape approaches necessarily include an explicit consideration of the use of space at many scales, ranging from the site or place (Binford 1982) to the region. Although landscape archaeology is not a well-developed theoretical approach, it provides a framework for examining the sources of variability in human behavior in a variety of contexts. If the landscape is described as a cultural phenomenon created through the human use and perception of the environment, then it becomes a powerful and flexible concept that allows archaeologists to combine many approaches to understanding human behavior. Because of the flexibility of the landscape concept, landscape archaeology allows consideration of many well-known theoretical concepts, such as evolutionary ecology and settlement pattern analysis, and provides room for consideration of social and ideological concerns. Perhaps the greatest strength of
landscape approaches is their mutual appeal to archaeologists from divergent theoretical traditions.

Although both the practical and symbolic aspects of subsistence could be pursued within a broadly defined landscape archaeology, at present, there is no body of theory that integrates the concepts of diet, meaning, and landscape. The study of hunter-gatherers and farmers can certainly be accommodated within landscape archaeology, and such an approach is recommended, but this approach does not in itself contribute to the question of causality in the transition to agriculture in northwestern Europe. The search for a body of theory that can encompass ecological and interpretative conceptions of subsistence must continue.

**Integrating concepts: information**

Mithen elegantly argued that evolutionary and interpretive approaches are not as different as is commonly assumed (1989). Ecological models and ideological metaphors are both concerned with how individuals make decisions about behavior in a cultural context. In making decisions, individuals have to sort through and consider a tremendous amount of information. The meanings of symbols are one kind of culturally important information. Unfortunately, we have few theories that address how information is transmitted. Tilley (1996) suggests that we lack any systematic theory of the meaning of things. However, if meaning can be thought of as a kind of information, then there have been some attempts by researchers interested in hunter-gatherers to develop theories that might be useful for examining how ideology affects behavior.

Moore (1981) argued that ecologically based optimization theories had done a poor job incorporating information. This
resulted in the observation that the local level models of interactions between humans and their environments revealed important patterns, but that these models could not be used to predict the broad scale patterns of hunter-gatherer behavior at the regional scale. Moore proposed that modeling information networks in hunter-gatherer societies would allow optimization theories to become more useful at the regional scale of analysis.

More recently, Hegmon and Fisher (1991) developed a model to understand the role of information about food resources in hunter-gatherer societies. They argue that strategies used to acquire and maintain long- and short-term information include direct observation of resources through scouting trips, information pooling in the context of communal rituals, and long-term storage of information in myths and stories. An examination of three ethnographic groups led them to the conclusion that cultural emphasis on information gathering and maintenance was related to the environment and resource structure, specifically the spatial distribution, predictability, and abundance of food resources. Information strategies were found to have a predictable relationship with the structure of resources. Long-term strategies, including myth, were found to be associated with resources that were variable in space, while short-term strategies, such as scouting, were associated with resources that were concentrated in time and space.

Other scholars have suggested that there are important links between environment and behaviors including ritual and religion. Minc (1986) links economic problems with cultural mechanisms, such as survival information included in myths, folktales, and rituals. The suggestion is made that ritual is more expensive and potentially more accurate than folklore. Rituals may remain the same over time because accurate practice of rituals is required to ensure successful
intervention by supernatural powers. Therefore, ritual is more important for maintaining information unchanged over generations.

These arguments have important implications for the role of ritual and religion in the transition to agriculture. Could the appearance of monuments, and the associated communal rituals, be associated with a need to accurately transmit survival information over multiple generations? How might this be related to the characteristics of domesticated resources? Because of the separation of the practical and symbolic aspects of subsistence, such questions have not been asked. However, the connection between ideology, the environment, and perceptions of the past has at least been considered among members of indigenous hunter-gatherer groups (Anawak 1989).

Aldenderfer (1993) developed further approaches to theory about the transmission of ideas in hunter-gatherer societies. Aldenderfer argued that while it is widely accepted that ritual has a role to play in the emergence of cultural complexity among hunter-gatherer groups, there has been no attempt to develop models of the place of ritual in this process of cultural change. Aldenderfer used cultural transmission theory, or dual inheritance theory, as developed by Boyd and Richerson (1985) to explore how ritual can act either to produce or prevent social change. Aldenderfer argued that ritual could be used to legitimize both the existence and elaboration of hierarchies within apparently egalitarian hunter-gatherer groups. A summary of cultural transmission theory is beyond the scope of this paper, but Shennan (1989) provides a useful review. In essence, Boyd and Richerson used the mechanics of genetic transmission as an analogy for cultural transmission and identified a number of key differences in how these two systems transfer information. The key is the recognition that, unlike biological transmission, any individual can have more than two cultural parents.
This concept is developed into a model of how people acquire information through cultural learning in a number of potentially biased ways. The result is a combination of Neo-Darwinian theory with a simultaneous process of cultural learning that itself is partly genetically mediated. The theory represents an optimization approach to the transmission of information that is very similar to the optimization approaches seen commonly in ecological anthropology. Cultural transmission theory provides a coherent body of theory that might be used to explain, interpret, or understand a “wide variety of phenomena such as the origins of symbolic systems, stylistic variation, and cooperation” (Aldenderfer 1993:3).

In cultural transmission theory, scholars interested in combining the practical and symbolic aspects of the concept of subsistence have a useful tool. While scholars concerned with interpretative approaches might shy away from the evolutionary implications of the theory, in the absence of any other coherent body of theory dealing with the transmission of information, cultural transmission theory should be considered. The wariness that archaeologists interested in interpretative approaches might show towards cultural transmission theory centers on misunderstandings about the use of models shown by advocates and critics of optimization studies. The argument will be made that optimization and interpretative approaches are not as different as they seem on the surface. Given this argument, the usefulness of the more holistic treatment of subsistence allowed by cultural transmission theory should be investigated by scholars interested in the transition from hunting and gathering to farming in northwestern Europe.
Discussion: models and metaphors

In the epilogue to *An Ethnography of the Neolithic*, Tilley (1996) concedes that without a systematic theory of the meaning of things, interpretation is necessarily *ad hoc*. He further argues that all theory is reductionist and essentialist. The interpretative approach in archaeology, widely used by scholars interested in the Neolithic, is based on post-structuralist theory that treats the archaeological record as a text that is constructed, deconstructed, and reconstructed by archaeologists through the practice of discourse. The practice of archaeology in such approaches is largely understood through metaphors of reading and writing the past in the present. This use of metaphors is extended as a kind of theory when Tilley suggests that any general theory of material culture is likely to be built on metaphor (1996:338).

Metaphors are compressed analogies that transfer meaning between different concepts through similarity. It is up to the reader or listener to make the connections of similarity between the concepts to understand the meaning of the metaphor. In the introduction to his book, Tilley asserts that the “great excitement of archaeology…is no longer that of discovery” (1996:4). This implies that there is little more to be learned from finding new archaeological sites and excavating them. This statement could be debated fiercely, but another implication of the statement is more important here. Tilley implies that the excitement of archaeology is to be found in the use of new metaphors for understanding the past.

Is this use of metaphors in interpretative archaeology really so different from the use of models in archaeology? After all, not just any metaphor has been used to interpret the Neolithic. Megalithic tombs are houses for the dead. Monuments domesticate
the landscape. These metaphors are based on an examination of the similarity of the specific features of the items compared in the metaphor. Metaphors have rules, but they are usually implicit. Models, like metaphors, also have rules, but the rules are often made more explicit. Models include statements of relationships between variables in order to simplify the complexities of the phenomena being investigated. Therefore, in contrast with the assumptions of many scholars, models are metaphors or are more like similes. Scholars never say that models are reality. They say that models are like reality. Models are conceptual constructions that are used to interpret the features of the archaeological record that archaeologists think of as data.

Scholars often say that they are “testing” models against data, but most scholars admit that these tests are inadequate, and they are left to interpret the differences between their models and their data in a variety of ways (Jochim 1981, 1983; Moore 1981; Hegmon and Fisher 1991; Aldenderfer 1993; Price 2000a). To use a common metaphor, models are a kind of lens through which scholars view their data in order to make interpretations. One looks through the lens to see how well it fits. In this way, models of subsistence in the Mesolithic of northwestern Europe can be seen as networks of partial connections between subsistence, mobility, and technology, and ideology. Metaphors are equally partial connections, but the examination of the basis for comparison in metaphors is not given explicit attention. It is left to whoever encounters the metaphor to unpack the multiple and ambiguous meanings. If more explicit attention were given to the specific features of the elements being compared, then metaphors would look much more like models. Certainly more effort could be put into developing the connections between subsistence and ideology in both ecological models and interpretative metaphors. Theories
like Boyd and Richerson’s cultural transmission theory might allow
the development of models that can do just that.

It seems easy for scholars already interested in ecological
approaches derived from evolutionary theory to think about how
to include ideology in their models by incorporating theories about
the transmission of information. What about scholars more
interested in interpretative approaches? Tilley (1996) has called for
the imaginative use of metaphors in attempts to understand the
human past. However, creative thinking requires the discipline of
rules. Imagination without constraints is unlikely to produce novel
ideas or items that can be accepted by society (Boden 1998). The
imaginative use of models as metaphors, or similes, might prompt
new questions to be asked. For example, how might ideology affect
food-getting practices? The reverse is equally compelling. How might
subsistence affect ideology?

The processes of human evolution by natural selection are
already being used as an analogy in dual inheritance theory for ideas
about social learning, yet no one is saying that cultural change is
biological change. It is easy to accuse such models of reductionism,
but the same criticism has been applied to the use of metaphors. It
might be more challenging, and interesting, to apply such models
as metaphors for understanding the past. This is especially true when
one considers the lack of any other well-developed theory for the
transmission of information. The integration of models and
metaphors in archaeological practice will allow a more holistic
treatment of concepts like subsistence, and this ability will contribute
directly to a better understanding of processes that took place in
the past like the transition to agriculture.
Conclusion

Researchers dealing with different aspects of the transition to agriculture in Europe have divided the concept of subsistence in a way that prevents productive debate. Scholars interested in Mesolithic hunter-gatherers treat subsistence as the practicalities of obtaining food, and this is usually done within an ecological framework that is ultimately derived from evolutionary theory. Researchers interested in early farmers have emphasized the symbolic role of subsistence in their use of domestication as the primary metaphor for interpreting the material culture of the Neolithic. This leaves scholars working in these time periods with the impression that “successful farmers have social relations with one another, while hunter-gatherers have ecological relations with hazelnuts” (Bradley 1984:11). This separation reflects a larger disciplinary division in anthropology between scientific and humanistic approaches. The argument has been made that subsistence is intimately bound up with technology, economy, social organization, and ideology. Researchers need to work on the development of theory to link these concepts. It has been suggested here that landscape approaches and cultural transmission theory should be examined in terms of their abilities to provide these crucial links. With regard to cultural transmission theory, it has been argued that those who view any approach derived from evolutionary theory, such as optimization models, to be overly simplistic and reductionist have an incomplete understanding of the complementary roles of models and metaphors in understanding human behavior.

The suggestion that the transition to agriculture had little to do with subsistence ignores this problem altogether. In terms of the emphasis on ideology, at least two important questions are raised: 1) How can ideology be incorporated into ecological models of the
subsistence practices of Mesolithic hunter-gatherers; and 2) How can models of subsistence be reincorporated into the metaphors used to understand the Neolithic farmers? Much research has broken down the traditional boundaries between the Mesolithic and the Neolithic in northern Europe. In some ways, the first farmers might be better thought of as complex hunter-gatherers. But the theoretical approaches associated with hunter-gatherers and farmers have clouded any understanding of this critically important transition. Broadly speaking, archaeologists on both sides of the transition need to ask: Why does ideology matter? What are the implications of ideology for subsistence? What are the implications of subsistence for ideology? Subsistence is an important concept in the study of humans because it represents the base of all human behavior. Subsistence includes the means of human survival and a potent source of meaning and metaphors. Asking questions about the connections between subsistence and ideology will allow the development of more theory that can link two domains of human behavior that are too often separated.

References cited

Aldenderfer, M.

Armit, I., and B. Finlayson

Ammerman, A. J., and L. L. Cavalli-Sforza
1973 A Population Model for the Diffusion of Early Farming in Europe. In The Explanation of Culture
Michigan Discussions in Anthropology


Anawak, J.

Andersen S. H., and E. Johansen

Anschuetz, K. F., R. H. Wilshusen, and C. L. Scheick

Ashmore, W., and B. Knapp

Barton, R. N. E., P. J. Berridge, M. J. C. Walker and R. E. Bevan

Bender, B.

Bender, B., ed.
Transition to Agriculture in Northwestern Europe

Binford, L. R.

Boden, M. A.

Boyd, R. and P. Richerson

Bradley, R.

Bradley, R. and M. Edmonds
Carter, R.

Childe, V. G.

Clark, J. G. D.

Clutton-Brock, J. and N. Noe-Nygaard

Conneller, C.

Cummings, V.
2003 The origins of monumentality? Mesolithic world-views of the landscape in western Britain. In Mesolithic...
Transition to Agriculture in Northwestern Europe


Day, S.

Dumont, J. V.

Feinman, G. M.

Frayer, D. W.

Gregg, S. A.

Hegmon, M., and L. E. Fisher
Hodder, I.

Holden, T., J. Hather, and J. Watson

Jochim, M.

Layton, R.
1999 The Alawa Totemic Landscape: Ecology, Religion, and Politics. In The Archaeology and Anthropology of
Transition to Agriculture in Northwestern Europe


Lee, R. B. and I. DeVore

1968 Man the Hunter. Chicago: Aldine.

Lillie, M.


Lubell, D., M. Jackes., H. Schwarz, M. Knyf., and C. Meiklejohn


Mellars, P.


Milisauskas, S.


Minc, L. D.


Mithen, S.


Michigan Discussions in Anthropology


Moore, J. A.

Perry, D.

Pollard, J.

Price, T. D.

Price, T. D., ed.
Transition to Agriculture in Northwestern Europe

Richards, M., and R. Hedges

Richerson, P. J., R. Boyd, and R. L. Bettinger

Rowley-Conwy, P.

Rossignol, J., and L. Wandsnider

Schulting, R. J.

Shanks, M., and C. Tilley
Shennan, S.

Sherratt, A.

Smith, C.

Smith, E., and B. Winterhalder

Strassburg, J.

Thomas, J.
Transition to Agriculture in Northwestern Europe

Tilley, C.

Ucko, P., and R. Layton

Whittle, A.

Winterhalder, B., and E. A. Smith

Woodman, P.

Zvelebil, M.
Michigan Discussions in Anthropology

Zvelebil, M., and P. Rowley-Conwy
