

Introduction

In the fourteen years since the publication of the *Man the Hunter* symposium (Lee and DeVore 1968a), there has been a considerable growth of research interest in hunter-gatherer behaviour. The proposition that human societies have spent over 99% of their cultural history as hunters and gatherers has become almost a truism, and little justification is required for a field of research which is seen as providing both a cultural baseline for the emergence of agricultural and urban societies and a behavioural and evolutionary link between our remote biological origins and our present-day condition. Yet, despite the fact that over 99% of the world's hunters and gatherers lived in the prehistoric past and are amenable to study only through archaeological methods, most theorizing about hunters and gatherers has been supported largely by ethnographic and ecological data, and empirical research in prehistoric archaeology has been relatively slow to respond to the development of new theoretical perspectives. The interaction between theory and archaeological data has tended to be at best a one-way process in which ideas established in other disciplines are brought in to help explain or interpret existing features of the archaeological record or to predict what ought to be there. There has been little exploration of the ways in which data about the prehistoric past can make their own distinctive contribution to the creation of new theoretical concepts, and the influence of prehistory on the development of theory, apart from

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demonstrating the long time-spans over which hunter-gatherer behaviour patterns have persisted, has remained negligible.

Broadly two major trends can be discerned in the development of hunter-gatherer studies during the past decade. The first is the development of general models and theoretical concepts about the fundamental principles of hunter-gatherer adaptation. The concept of adaptation focuses on patterns of reproductive success and subsistence. Hence interest has mainly centred on subsistence ecology and demography as the primary clues to a unifying perspective (Wobst 1974a, 1976; Durham 1976; Jochim 1976; Keene 1979; Bettinger 1980; L.R. Binford 1980; Earle and Christenson 1980; Winterhalder 1980, 1981), but has also included studies of the influence of social organization and ideology (Sahlins 1974; Wobst 1976, 1977; Ingold 1980, 1981). The archaeological input to this literature – with rare exceptions – has been relatively minor. Where archaeological data have been referred to at all, they have usually been used as illustrations of established principles rather than as raw material for the building of new theoretical structures. Inspiration has rather been sought in the theoretical models of other disciplines such as ecology, social anthropology and ethology (including sociobiology), in the mathematical simulation techniques derived from game theory and decision theory, and in the examination of ethnographically observed case studies as test data.

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A second trend, characteristic of specifically archaeological research, has been the development of operational concepts by which to transform the inert data of the material record into behavioural patterns – middle-range theory in Binford's (1977a) terminology – and in the analysis and interpretation of particular historical patterns. Major growing points have been the archaeology of early hominids and the very earliest steps towards a recognizably distinctive human pattern of hunting and gathering (Isaac and McCown 1976; Leakey and Lewin 1977; Isaac 1978; Binford 1981) where the biological and palaeontological features of human evolution viewed within the established framework of natural selection theory continue to provide a dominant focus of interpretation; the very latest stages of hunting and gathering where they merge into early agriculture (Higgs 1972, 1975; Megaw 1977; Reed 1977; Jarman *et al.* in press); and the ethnoarchaeological study of surviving or recently observed hunters and gatherers (Yellen 1977; Binford 1978a; R.A. Gould 1980; Smiley *et al.* 1980).

It is not without interest or significance that these growing points all lie on the peripheries of the archaeological record, at the very beginning or the very end of the hunter-gatherer chronological span. At first sight these developments would appear to represent a diversion from the primary goal of analysing prehistoric hunter-gatherer behaviour, a retreat from the central core of the prehistoric archaeological record, albeit a retreat that might ultimately facilitate a more effective attack. In part this reflects the current perception that the earliest and latest periods of the hunter-gatherer span are where the dramatic changes in sociocultural evolution occur, the intervening millennia offering less interesting or less easily studied material either from the biological or the cultural point of view. But it is also symptomatic of the immense difficulties that impede theoretical interpretation of archaeological data in their own terms, and a measure of the centrifugal force exerted by the ambiguities of the archaeological record in pushing the centre of theoretical interest out towards the lesser uncertainties of the biological past or the agricultural and ethnographic present.

A number of factors have contributed to the pattern of these recent developments, including theoretical preconceptions as well as practical limitations of the data. One factor is the normative concept of hunting and gathering as a single 'way of life' which, despite its long duration, can be summed up in a few simple generalizations, a notion that is not discouraged by the relative rarity of surviving hunter-gatherer societies available as test data. It is here, perhaps, that recent archaeological research, by concentrating on the boundaries of the hunter-gatherer world, has had its greatest impact. This is apparent in the challenge to the classificatory division between hunter-gatherers and farmers (Higgs 1972, 1975; Jarman *et al.* in press), in the detection of different principles of organizing subsistence strategies amongst ethnographically observed hunter-gatherers (Binford 1980), and in the examination of the relationship between hunting,

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scavenging and other forms of non-human or pre-human predation in the earliest stages of human development (Isaac 1978; Binford 1981). The latter theme also recurs at the other end of the chronological scale in discussions of early agriculture and animal domestication (Jarman and Wilkinson 1972; Rindos 1980). The erosion and replacement of the monolithic conception implied by 'hunting and gathering' has been one of the more original consequences – and to some extent a justification – of recent tendencies in archaeological thinking, and this is an interest which has now begun to be tackled from an anthropological point of view as well (Ingold 1980; Woodburn 1980).

A second restraint on the archaeological study of hunters and gatherers is the very real difficulty of reconstructing patterns of behaviour from the material record. The formidable technical problems posed by data recovery, excavation, sampling, dating and palaeoenvironmental control hardly need emphasizing, while the investment of time, effort and money that is required to bring to final publication the excavation of even a single site should not be underestimated. Regional studies multiply the practical problems. Satisfactory results may be achieved only after decades of work, and it is not unknown for the completion of large-scale field projects to represent a posthumous tribute to the vision of their originators.

Added to this is the problem that by far the most prolific type of data surviving in palaeolithic deposits, namely lithic artefacts, is also one of the most ambiguous indicators of behavioural patterning. The difficulties of analysing and interpreting variability in lithic material have given rise to a virtually autonomous field of inquiry with its own literature and methodology. Although this has its own growing points in the development of mathematical techniques, use-wear analyses and raw-material studies, many of its major preoccupations are necessarily far removed from the ultimate objective of recovering behavioural activities and adaptations. The archaeological prominence of lithic debris and the ambiguities of its interpretation are also primary motivations for the diversion of effort away from prehistoric research into ethnoarchaeological analysis, in the search for general principles by which to transform material data into patterns of behaviour.

Finally, the difficulties of working with material data have given rise to a special use of theoretical procedures, in which theoretical models are used not so much to explain patterns of past behaviour but to aid in recreating those patterns by filling gaps in the prehistoric record for which material data are lacking. Hence the theories tell the archaeologist what past behavioural patterns ought to look like rather than explain directly observable or independently verifiable patterns visible in the record. Clearly theories of this sort are immune to archaeological testing, except by circular argument, since they are the source of the patterns derived from the archaeological record. This further weakens the case for prehistoric research.

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However, the most influential restraint on prehistoric research, and one which in some measure contributes to the other factors already discussed, is the paralysing ambiguity of uniformitarian orthodoxy. Uniformitarianism can mean different things: that there are constants or universals underlying visible patterns of diversity and variation; that events in the past should be explained by processes observable in the present; or that change is slow and gradual rather than sudden and disruptive. Belief in any one of these does not necessarily entail acceptance of the others. The first meaning corresponds to S.J. Gould's (1965) definition of methodological uniformitarianism – a belief in universal principles. The other two meanings broadly correspond to his definition of substantive uniformitarianism – a belief that processes and rates of change were similar in the past to those visible in the present. These two definitions are not necessarily incompatible, although they may be, depending on the nature of the subject matter. Substantive uniformitarianism has long been rejected in geological theory. In biological theory it is an integral part of the neo-Darwinian synthesis of evolution by natural selection, although increasingly under attack (Gould and Eldredge 1977). In archaeology and the human sciences generally there has been relatively little explicit discussion of this point, although a belief in substantive uniformitarianism is the implication of most studies (Bailey 1981a; Dalton 1981). In archaeological research uniformitarian principles usually rest on the belief that people in the past behaved much as they do in the present, with similar social structures, economic strategies and cognitive abilities. Essentially the belief is that there are certain continuities of human thought and behaviour which provide a link through time, enabling our ignorance of what happened in the past to be enlightened by our knowledge of the present.

In one respect uniformitarian assumptions can have a liberating influence on archaeological research, especially at the operational level, where they are used as a means to an end rather than as the ultimate object of inquiry, offering a key with which to unlock information from the archaeological record that would otherwise remain hidden, rather than providing the final answer. Thus Binford (1978a, 1981) has emphasized the advantage in faunal studies that animal anatomy provides a known framework which can serve as a reference point for measuring variation in the pattern of prehistoric faunal exploitation (see Part 1 below).

Site territorial analysis and the associated concept of the site exploitation territory (see Parts 2 and 3) exemplify both the potentials and the pitfalls of this sort of approach, employing the uniformitarian principle of least effort and the 2-hour walk in order to define potential areas of habitual exploitation around archaeological sites. However, the notion that the aim of site territorial analysis in archaeology is to illustrate or test the principle of least effort, or to define the boundary of site exploitation territories as an end in itself, would strike most field practitioners as absurd. Although there are certain restrictive conditions under which such a test

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might be possible without recourse to circular reasoning, it would be irrelevant to many archaeological research designs. Rather the aim is to provide a framework within which to obtain a sharper focus on the relationship between subsistence data, site location and the natural environment. As many practitioners have pointed out, the precise accuracy of a postulated universal such as the 2-hour territorial boundary is not really at issue when the objectives of analysis are to detect broad relative variations between sites or regions. The important point in these sorts of analyses is that the relationship under scrutiny is between two (or three) sets of data, *all of which are archaeologically visible* (or potentially so). In effect one set of relationships (the relationship between human energy expenditure and food returns) is being held constant in order to provide some control on another set of relationships, that between environment, site location and subsistence. Thus the aim is to play off against each other two or three sets of independently verifiable data, rather than to explain one set of data in terms of another set which is archaeologically invisible and can only be derived by extrapolation from a non-archaeological context. This is a major principle underlying much ethnoarchaeological research, where the expressed intention is usually to establish some uniformities in the relationship between the material record and the behaviour patterns that produce it. However, the literature on site catchment analysis is ample testament to the confusions that can arise over misuse of this principle, and to the narrow line that separates the self-fulfilling prophecy from the signpost to an empirically knowable but as yet unknown reality.

The ambiguity of uniformitarian assumptions, as well as the latent paradox they embody, becomes even more marked when one moves from the level of operational procedures to general theory. For if the aim of archaeological inquiry is to identify unifying principles of general applicability, and if it is assumed that these principles can be derived in their entirety from the study of contemporary or near-contemporary societies, then prehistory becomes irrelevant except as an end in itself, capable of being enlightened by theoretical knowledge, but contributing nothing to it. Taken to its logical extreme substantive uniformitarianism condemns archaeological research to 'ethnography with a shovel' (Wobst 1978: 303), or an idiographic discipline concerned with individualities rather than generalization, and thus an exercise appealing to diggers and antiquarians but to few others. Moreover the insistence that past patterns of behaviour should look like present ones imposes a commitment on the archaeologist to reconstruct the past in the same sort of detail and with the same sort of expectations as would be attempted in ethnographic or ecological or ethological studies. Categories and concepts derived from other disciplines thus propel archaeological research forward in a frantic and never-ending search for the elusive goal of better data – for more carefully controlled samples, more detailed stratigraphies and more accurate

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dating methods – discarding along the way as inadequate a vast quantity of already accumulated data. Substantive uniformitarianism can thus have a doubly paralysing effect on archaeological research, demanding a resolution and a detail from the archaeological record which current techniques are scarcely able to fulfil, yet denying the theoretical relevance of any patterns they might yield.

This consequence is further sanctioned by the theoretical premises of two of archaeology's most powerful disciplinary neighbours, ethology and social anthropology. Both have made a virtue of necessity, developing comparative methods for deriving general principles from a diversity of contemporary instances, and favouring theories which do not depend on historical knowledge. Ethology, despite its interest in the evolutionary history of behaviour patterns, is forced back on indirect methods, since there is no behavioural equivalent of palaeontology (Hinde and Tinbergen 1958). Moreover the emphasis on the biological basis of behaviour has usually carried with it an acceptance of neo-Darwinian evolutionary theory with its strong implication that large-scale evolutionary patterns can be explained in terms of the small-scale selection processes that lie within the range of focus of the contemporary observer – in effect that the evolution of horses can be understood by looking at fruitflies. Whatever the power and success of this approach in animal behaviour studies, or the validity of natural selection as a working hypothesis in human behaviour, attempts to derive theories of human social evolution via the hybrid terminology of 'biogrammars' and 'culturgens' has done little to assuage the well-deserved scepticism of anthropological commentators (Gluckman 1972; Leach 1981), or to bring into focus the behavioural potential of the archaeological record which forms the historical bridge between our animal ancestry and our present-day behaviour.

Social anthropologists have generally been more cautious about deriving theories of historical change from contemporary observations, and indeed have tended to favour theories with an emphasis on the synchronic, in which history is deemed largely irrelevant. Although the value of historical knowledge is periodically re-emphasized in anthropological study of contemporary societies (Evans-Pritchard 1961; Goody 1976, 1977), there nevertheless remains a lingering sense in the discipline at large that theories of long-term change can be derived by extrapolation from contemporary observations or by logical elaboration of a few axiomatic principles, and that any novel behavioural patterns thrown up by prehistory would be little more than exotic variations on themes whose main outlines were already clearly defined.

One of the attractions of concentrating archaeological research on the early hominid or the ethnographic and agricultural ends of the hunter-gatherer spectrum lies in the fact that these are all areas of research which lie very close to the data and theories of well-established disciplines. Evolutionary biology, social anthropology and agricultural economics provide secure and sensible launching points from which to explore the unknowns of the prehistoric past, but at

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the same time immediate surroundings of diverse interest, easy accessibility and frequent controversy which provide ample excuses for resisting departure. If there is to be a sense of future direction in hunter-gatherer studies, it will require a strong commitment to the exploration and comparison of prehistoric case studies, awareness of the reference points provided by other disciplines without subservience to them, and ultimately a belief that history and anthropology (in the broadest sense of those terms) can be reunited in a dialogue fruitful to both, in which an understanding of historical patterns not only benefits from existing theoretical knowledge but contributes to it.

One does not have to search far for clues as to what sort of historical knowledge might be theoretically valuable. The conception of behaviour as an integration of processes operating at different time-scales and with different periodicities has long been familiar in biology (Haldane 1956; Gould 1965) (although overshadowed to a large extent by the highly successful reductionism of neo-Darwinian theory). Braudel (1972) has made famous a similar conception of human history as being separable into different layers, ranging from the deep and slowly-moving currents of 'geographical history' to the more fast-moving and ephemeral surface changes of social and individual history, each layer being in contact with the others but not reducible to them. Such a notion of history provides a far more enlightening perspective than other examples of the historian's approach more usually held up as models for archaeological imitation. Bonner (1980) has recently suggested a similar resolution of the current impasse between biological and sociological theories of human behaviour, emphasizing the concern of the former with the limits to variation and the ways in which those limits change over the long term, and the concern of the latter with the short-term, small-scale variations that occur within those limits. Such a perspective does not of course exclude the possibility that variations in behaviour at a small scale might overcome pre-existing limits and generate long-term changes. Changes of social organization, for example, especially in so far as they affect patterns of reproduction and demography, can have far-reaching biological and social consequences (see Part 4). Thus interactions of many different kinds can occur between different scales of behaviour (Holly 1978).

Turning to more specific issues, the current uncertainty about the reliability of the ethnographic record as a mirror of 'typical' hunters and gatherers (Wobst 1977; Schrire 1980) helps to emphasize the point that ethnographically observed societies are the outcome of a long historical process which it is the purpose of archaeological study to trace and explain. Wobst (1977) has pointed out that patterns of behaviour among ethnographically observed hunter-gatherers may have been influenced by contact with colonizing cultures. Schrire (1980) has suggested that the !Kung Bushmen, widely quoted as a typical example of the hunter-gatherer way of life, may formerly have been farmers who have only recently resorted to hunting and gathering as a preferable livelihood in a

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marginal environment. These cautions do not undermine the potential value of comparative ethnographic studies as clues to general organizational principles. But they do highlight the problems of distinguishing what is truly universal in human behaviour from what is peculiar to the circumstances of particular geographical and historical contexts, and hence the need for time depth in comparative studies as well as geographical 'width'.

Sahlin's famous ethnographic characterization of stable affluence as the typical hunter-gatherer mode has already begun to give way to a more dynamic view under the impetus of an archaeological perspective (Cohen 1977; Bender 1978). There is also growing evidence to suggest that some of the unifying features of modern hunters and gatherers, such as the integration of local bands into larger social and biological units through reciprocal social ties and affiliations, may be a relatively recent development, and one closely related to the cultural and economic innovations and demographic changes which characterize the emergence of the European Upper Palaeolithic (see Part 4). In a broader evolutionary perspective, it is apparent that the decisive shift from a predominantly biological to a predominantly cultural mode of evolution took place in the prehistoric past, and that archaeological data should throw important light on the nature and causes of this transformation.

These are all pointers as to where new directions may be sought, and they are directions which the archaeologist is uniquely qualified to pursue. These are the goals which we can aim for, however intractable the data base may seem to be, and it is in this spirit that the present volume has been conceived.

Studies of subsistence economy form an obvious starting point for understanding hunter-gatherer behaviour, especially in its prehistoric dimension, since data on subsistence are more easily accessible to the archaeologist and more amenable to interpretation than the less tangible patterns of social organization and ideology. However, this is not to say that studies of subsistence will provide a sufficient understanding of hunter-gatherer behaviour, and a more general label is required to define the focus of study. For this purpose I have preferred the use of the general term *economy*.

Although there is room for considerable disagreement about the definition and purposes of economic prehistory and economic archaeology, the term *economy* may be used in its broadest sense as a descriptive term to refer to the exploitation and organization of resources used in the maintenance of human populations and societies, without commitment to one or other of the theoretical viewpoints currently in competition (Sheridan and Bailey 1981). The resources in question obviously include food as a primary target of study. But resources of time required in the manufacture and deployment of material technology (Part 1), and social resources embodied in patterns of social organization, and the ways in which these influence or are influenced by patterns of food exploitation (Part 4), are here treated as appropriate

fields for research under the heading of economy. A general definition of this sort is preferred here because it helps to focus on the nexus of interrelations between environmental and ecological factors on the one side, and social factors on the other, without giving undue emphasis to either side of the relationship. Such a definition is also intended to avoid prejudgement about what if any are the primary driving forces of social and cultural evolution, while encouraging exploration of the widest range of data sources. Food remains, site locations and palaeoenvironmental data figure prominently in many of the chapters in this volume, but there are also major discussions of stone artefacts (Parts 1 and 3) and artistic data (Part 4). The term *adaptation* provides an alternative characterization of the general field of study. But I have preferred to avoid its use for this purpose and to leave its discussion to individual authors, both because of the teleological implications imputed to it by its critics, and because it is open to varying definitions each with quite specific theoretical connotations.

The emphasis on Europe is a matter of practical convenience rather than a statement of belief about the primacy of this part of the world in human evolution, and reflects the growth of interest in reinterpretation of the European Palaeolithic rather than the absence of comparable work elsewhere. Even in Europe it is scarcely possible to do justice in a single volume to the new work in progress, and many areas are necessarily not represented. Europe has been rightly described as a peninsula on the edge of a continent, and the majority of the data presented here is further confined to western Europe, a truly parochial entity in relation to global geography. At the same time charges of Eurocentrism still lurk uneasily between the lines of the hunter-gatherer archaeological literature, in understandable reaction to the historical dominance of Franco-Cantabria in Palaeolithic studies. It may therefore be useful to emphasize some of the advantages of a European focus for present purposes in order to counteract any charges of extreme parochialism on the one hand or residual hints of cultural imperialism on the other.

In the first place, unlike the Americas, Africa, Australia, or parts of Asia, there is no historical continuity between the Palaeolithic record and an ethnographically observed hunter-gatherer present. While this obviously precludes the sort of ethnoarchaeological work that has been such a stimulus elsewhere, it also reduces the temptation to fill in the blank spaces of one's archaeological knowledge with plausible ethnographic colour. Any ethnographically supported principles applied to the European Palaeolithic must be of a high order of generality if they are to be of any serious use. This is reinforced by the fact that the European environment during the last glacial period had a number of ecological characteristics for which there is no modern parallel. Low temperatures combined with the insolation of middle latitudes produced an unusually rich periglacial flora and fauna. Europe is thus potentially the source of distinctive variations in behavioural patterns as well as a useful challenge to the

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validity of postulated general principles. Admittedly the latter point can probably be claimed for most areas of the world inhabited during the last glacial period, and is thus as much an argument for prehistoric study in general as for a European focus in particular.

A second important point is that long sequences and large samples of data are typical of the European Palaeolithic, both at the level of individual sites and at the regional scale. While much of the data was collected by former generations of archaeologists and can be questioned on the grounds that it may lack the quality and resolution that one would expect from application of modern techniques, it nevertheless represents the sort of large-scale sample that provides a useful starting point for the detection of major variations in the overall limits to behavioural patterning. In particular it provides a context within which to examine the long-term processes that are within the range of focus of the prehistorian. One such issue is the way in which subsistence exploitation and social organization responded to large-scale environmental changes induced by the onset of glacial maxima and subsequent deglaciation (Parts 3 and 4). Long-term variations in the geographical extent or localization of artistic expression and stylistic patterning in artefacts offer other rich possibilities for the examination of large-scale trends (Part 4).

Europe is also well placed geographically for the study of major changes in the limits to behavioural variation. For, although it was geographically peripheral to the main centres of Old World habitation throughout most of the Pleistocene, at the same time it represents a frontier region on the very margins of effective human occupation, and therefore a region sensitive to the development of new behavioural strategies. This is reflected in the evidence that the ecological and geographical limits to the human habitat were considerably expanded during the later Pleistocene, with effective colonization of the periglacial steppe and tundra, and territorial expansion into the northerly latitudes of Siberia and ultimately the New World (Part 4).

Finally, as regards the specific problems associated with the reconstruction of subsistence economies, it is probable that plant foods were relatively unimportant resources, especially during glacial periods or in higher latitudes. This is not to say that they can be completely ignored or that their importance did not vary. However, in as much as plant foods are notoriously invisible in the archaeological record, their likely scarcity in European palaeoenvironments provides a convenient simplification of the methodological problems posed by studies of prehistoric subsistence. Thus emphasis on faunal remains is likely to produce a less distorted view of subsistence and land-use patterns than might be the case in warmer climates or at lower latitudes.

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The temporal focus of this volume is primarily the last glacial period as conventionally defined (*c.* 70 000 b.p. to 10 000 b.p.), and the early postglacial, and thus covers developments in the latter part of the Upper Pleistocene and the early Holocene. This is likewise a product of convenience and practical necessities, intended to convey some sense of the possibilities offered by archaeological study of long time-spans, while necessarily ignoring the potential of earlier periods. Although many of the issues discussed in this volume have relevance to earlier periods, limitations of dating and data control in the Lower and Middle Pleistocene, and the nature of the behavioural and evolutionary issues that can be resolved within those limitations, pose formidable problems requiring separate study in their own right.

The chapters are organized in terms of four major themes forming a rough hierarchy of scale in order to highlight underlying problems of theory and method. The first focuses on the primary data – animal bones and stone artefacts recovered from excavation, which represent the most tangible and immediate sources of information. Successive themes broaden the range of focus, moving through discussions of spatial variation and temporal trends at the regional level, to the large-scale interactions that highlight major social and cultural changes. Interpretation of large-scale trends poses the greatest degree of uncertainty because it focuses on a wide range of factors, including the archaeologically elusive variable of social organization, and its success depends on controlling the smaller-scale spatial and regional components of variability, and on understanding the limitations inherent in the use of primary sources of excavated material as test data. At the same time large-scale patterns bring into focus problems that can suggest new ways of analysing or interpreting smaller-scale regional or site-specific data. At the other extreme the focus on faunal and lithic data strikes at the very heart of what is involved in trying to reconstruct behaviour patterns from material data – of what the limitations are and how they can be overcome, of the questions that can be answered and those that may lie beyond the resolution of current techniques. It should be emphasized that the primary data sources raise their own issues of theory and of large-scale change no less than of method, while spatial and temporal trends pose their own problems of method as well as of theory. Thus the four major themes are strongly interdependent, and in the interest of flexible research design a number of chapters span two or more themes. The thematic boundaries defined here are not to be applied too rigidly. Indeed their replacement by others, as new problems and issues emerge, will be a measure of the extent to which archaeological study of prehistoric hunters and gatherers can promote self-sustaining growth as a vigorous and healthy empirical discipline worthy of the name.

PART ONE

**Primary data sources:
problems of theory and method**

Chapter 2

Editorial

Animal bones accumulated as food refuse and artefacts of stone (and less often of bone) together represent the primary materials recovered in excavation of prehistoric hunter-gatherer sites. They are the primary data sources which support interpretation in relation to the issues examined in Parts 2, 3 and 4 of this book. They can also be analysed in their own right to provide information on a range of behavioural and cultural issues. As such they offer a useful initial focus on some of the basic problems posed in the analysis and interpretation of prehistoric behaviour.

Traditionally both types of materials have been exploited for their chronological implications. Archaeological analysis of artefacts has been used to build up a relative time–space framework of cultural variation. Zoological analysis of the faunal remains and their evolutionary status and palaeoenvironmental implications has been used to provide a framework for inter-regional and inter-continental correlation. The development of radiometric dating, aided by more sensitive palaeoenvironmental techniques based on such indicators as pollen, beetles or the oxygen-isotope content of marine foraminifera (Butzer 1971a; Evans 1978), has progressively eliminated the need for such chronological studies (as well as exposing the inadequate assumptions on which many were founded). This in its turn has helped to break down the barrier between stone artefacts as reflections of human culture and animal bones as reflections of the

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natural environment, and to encourage new theoretical perspectives and new methods relating both types of material more directly to cultural and behavioural issues.

In the case of faunal studies this has increasingly involved the active participation of the archaeologist both as interpreter and analyst, and has thus placed increasing demands on the training of individuals within an archaeozoological rather than a narrowly zoological frame of reference (Brothwell and Higgs 1969). Artefact studies, meanwhile, have moved towards increased emphasis on the value of specialist studies of other disciplines, such as geological sourcing or the study of fracture mechanics (Hayden 1979).

Apart from the relatively obvious relationship between fauna and cultural behaviour via the subsistence economy, there have been a number of suggestions about the ways in which faunal data might be harnessed to cultural problems or artefactual data to biological and ecological concerns. These ideas range across a wide spectrum from 'functionalist' exhortations about the role of artefacts as extra-somatic aids to adaptation (L.R. Binford 1962) to 'structuralist' assertions about the culture-symbolic patterning preserved in spatial distributions of animal-bone refuse (Tilley 1981). Studies of stylistic variation in material culture represent one promising focus for the integration of functionalist and culture-symbolic interests (Wobst 1977). They involve special considerations which are treated more fully in Part 4 in the context of large-scale social change. Despite these developments it is still relatively rare for the bone and stone material from an excavation to be treated together in integrated fashion, or with equal emphasis, or to be seen as equally important contributors to a common objective. In part this reflects on-going traditions of training and disciplinary demarcation, in which expertise in the analysis of one set of material is held to exclude expertise in the other. In part it reflects a lack of any coherent or methodologically well-founded theoretical framework in which both sets of data can participate on equal terms. Theoretical concepts which define relevant variables and supply a framework for interpreting observations of the basic data are as yet little developed in relation to either set of materials in isolation, let alone in combination. A continuing problem is the lack of clear or widely agreed guide-lines about so-called 'middle-range theory' – about how patterns of material data are to be transformed into patterns of past behaviour (Schiffer 1976; Binford 1977a). These problems affect faunal and lithic studies alike, although in differing degree.

The interpretation of artefact data in terms of behaviour is much less advanced in comparison with faunal studies, partly because general concepts about the causes of artefact variability have been little developed, and partly because the middle-range theory that would allow the transformation of artefact variability into patterns of behaviour is still very poorly understood. The function of most categories of prehistoric stone tools is still mainly a matter of speculation. Even the very definition of what constitutes a specific tool

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type is a subject of considerable debate. Attempts to interpret assemblage variability in functional terms through comparison with site locations and environmental patterning may entail a number of quite complex issues which are extremely difficult to control for archaeologically, even in apparently favourable circumstances (see, for example, Parkington 1980 and comments). Statistical correlation techniques are unlikely to have much additional impact without some initial decisions as to what constitute relevant variables and what might constitute significant correlations. Use-wear analysis is still beset by an array of technical issues and is in an early stage of development in which its ultimate potential remains difficult to assess. It is perhaps scarcely surprising that stone-artefact analysis has tended to gain a certain notoriety in the wider archaeological community as a rather sterile end in itself, rather than a means to a further end. However, as Torrence emphasizes in chapter 3 of this volume, stone artefacts are usually far more abundant than faunal remains, and on many sites are the only surviving evidence of human activity.

One approach suggested by Binford (1973) on the basis of his analysis of Mousterian variability and subsequent ethnographic work is to concentrate on the general structure of an assemblage in terms of patterns of tool manufacture and discard, in addition to measurement of morphological differences and typological categories. Binford's conceptual distinction between *curated tools* (made in anticipation of future needs) and *expedient tools* (made for the needs of the moment) has suggested new ways of thinking about artefact analysis which clearly have potential for detailed application and further development in archaeological contexts (e.g. Marks and Friedel 1977). Torrence develops this approach by focusing on the use of time as a crucial variable affecting hunter-gatherer decisions, and the ways in which time is budgeted or scheduled between different activities. This emphasis on time budgeting is of particular theoretical interest because it draws attention to a fundamental variable in human behaviour which is not only of relevance to artefact studies but which has a wider application to a whole range of behavioural issues including subsistence.

Her argument in broad outline is that certain types of environment will be 'time-stressed', notably ecologically specialized environments with a limited range of relatively mobile and unpredictable resources. Survival in these conditions is likely to be especially dependent on the efficient use of time, for example by scheduling activities into different time slots to avoid distracting conflicts, and by increasing the speed and efficiency with which critical activities such as the capture and retrieval of elusive prey can be effected. In these conditions material equipment is likely to take the form of a relatively wide range of highly specialized and complex tools, each designed to achieve efficiently a limited range of tasks. The investment in advance production of complex equipment will be facilitated by scheduling, and rewarded by the more efficient completion of the designated task. Conversely in more generalized environments with a wider range of resource

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options, including relatively predictable and easily collected resources such as plant foods, constraints on efficient time budgeting will be relaxed, with concomitant changes towards more 'generalized' tool-kits characterized by multi-purpose tools, and simpler designs and manufacturing processes. A number of important qualifications on this general theme, and the problems of its practical application, are elaborated.

Torrence's approach is interesting in two ways. In the first place at least two of the three proposed measures of assemblage structure, namely composition (functional categories of tools), diversity (number of tool types) and complexity (number of parts per tool-kit), would seem to lend themselves to measurements of relative differences between assemblages, independently of any knowledge about the specific function of particular artefacts. At least this is the case for the latter two measures.

Secondly the theory emphasizes time budgeting as an underlying variable in all human decision-making and hence as a potentially unifying focus for the study both of material culture and of subsistence data. The distinction between time-stressed and 'time-relaxed' environments recalls Binford's (1980) distinction between logistical and foraging exploitation strategies (see Part 2). Thus we might expect to find correlations between variations in assemblage structure and variations in the structure of the natural environment and the subsistence strategies used in its exploitation. There is clearly some measure of support for this expectation in Torrence's analysis of ethnographic data. These considerations further suggest a realistic prospect for undertaking archaeological tests in which analyses of prehistoric assemblage structure are compared with independently derived palaeoeconomic and palaeoenvironmental data. The regional sequences discussed in Part 3 provide abundant evidence of substantial changes in assemblage structure against a background of changing environments and exploitation strategies. In particular Clark and Straus (chapter 12 of this volume) give some detailed analyses of variations in assemblage structure which indicate possibilities of development along these lines.

At the present, faunal analysis is in some ways in a more privileged position than lithic analysis, to the extent that theories of animal behaviour and ecology and the knowledge of animal anatomy provide a well-established framework within which to examine variability in food-refuse patterns. Various features of faunal assemblages of relevance to the human use of animal populations can be analysed within this framework, such as the proportional representation of species, patterns of bone breakage, or the analysis of mortality patterns. The last is the theme of the other two chapters in this section and has a direct bearing on one of the more contentious issues in human social evolution, namely the origins of animal domestication.

Analysis of mortality patterns was originally developed as an alternative to the reliance on morphological indicators in studies of early domestication. An initial assumption was that hunting strategies would produce a random cull in which

the age at death of the exploited animals reflects the natural age structure of the living population, whereas domestication would produce a selective cull in which certain age classes, notably the immature, are disproportionately represented (Perkins 1964; Ducos 1978). Higgs and Jarman (1969) observed that a high percentage of immature animals are found in assemblages of supposedly wild animals in early contexts (for example rhinoceros in the Middle Palaeolithic), an observation intended less to assert the existence of early domestication than to challenge the conventional division of animals into Pleistocene 'wild' and Holocene 'domesticated', and to encourage critical appraisal of the criteria by which such a division had been maintained. In the aftermath of the debate that ensued (see, for example, Jarman and Wilkinson 1972; Jarman 1976 and discussion), it became apparent that reliable interpretation of mortality patterns would require a detailed understanding of the ecological factors that influence variability in the natural population structure of the prey species, as well as the development of appropriate techniques for distinguishing age classes in prehistoric faunal material.

Hunting strategies, as both Levine and Klein *et al.* emphasize (chapters 4 and 5), may give rise to two quite different mortality patterns, depending on the hunting techniques employed and the behaviour of the prey species: (1) *catastrophic mortality patterns*; and (2) *attritional mortality patterns*.

Catastrophic mortality patterns can be produced by a variety of strategies. These include mass slaughter of whole social groups, for example by driving techniques, but would by no means be limited to that technique. They could also include random hunting by stalking or trapping individual animals, as discussed by Levine. Attritional mortality patterns are characteristic of stalking individual animals and typically result in an age profile weighted towards the weaker and more vulnerable individuals, such as the young and the old. With some species it would appear that a high percentage of immature animals, once thought to be a sign of domestication, may in fact be what would be predicted in some types of hunting strategies, both random and attritional.

Levine elaborates a number of variations on the two basic patterns of mortality in the context of horse exploitation, with particular reference to Middle and Upper Palaeolithic assemblages in France and Germany. She emphasizes the effect that horse social behaviour can have on population structure, leading to the segregation of particular age (and/or sex) classes in different geographical ranges at certain seasons or during certain stages of the life cycle. Fluctuating environmental conditions can also affect herd structure by leading to disproportionate representation of particular year classes, depending on the varying balance of natural mortality and natality factors from year to year. Klein *et al.* similarly employ catastrophic and attritional mortality patterns in their discussion of red deer exploitation in Upper Palaeolithic Cantabria and Mesolithic Britain. It is interesting to note that both chapters propose slaughter of whole social groups as the

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most likely hunting strategy in the majority of cases (see also Clark and Straus, chapter 12 below).

On the methodological side, simple classification into immature and adult categories has long been superseded by more detailed ageing criteria. Here both authors use crown height measurements as a means of placing individual teeth within more or less narrow time-spans. These may not be assignable to specific age classes with any accuracy, but are nevertheless useful in discriminating different mortality patterns. This technique provides a useful complement to the better known tooth eruption and wear sequences worked out for the common farmyard animals (Higham 1967; Payne 1973) and for red deer (Lowe 1967). It also has the additional advantage that it is not limited to mandibles but can be applied to finds of isolated teeth, an advantage which greatly increases the sample size in most assemblages.

Several remaining problems may be noted. One is the possibility that juvenile teeth may be systematically under-represented because of differential representation, an objection that can be mitigated if not wholly overcome by applying a systematic adjustment factor (Levine), or by considering the state of preservation of other material (Levine and Klein *et al.*). Another potential difficulty is small sample size. A further uncertainty lies in the possibility that quite different

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exploitation strategies might give rise to similar mortality patterns. For example, the culling policy recommended in some patterns of animal husbandry would produce an attritional mortality pattern not unlike that created by some hunting strategies. The difficulty of reliably sexing adequate samples of horse or deer material is a major handicap here. Differential culling of young males is a feature of livestock management, and differentiation of males and females in prehistoric mortality profiles would provide useful additional information in discriminating between alternative strategies. Detailed antler studies can sometimes throw light on this problem in deer species (e.g. Sturdy 1975). But interpretation is usually hampered by small samples and by the likelihood that the representation of antlers will be distorted by their use as raw material for making artefacts. Other more indirect information can sometimes clarify the nature of the exploitation strategy, for example the evidence of site locations (see chapters 7, 8, 13 and 15). Nevertheless the value of establishing differences and similarities between assemblages is clearly apparent in Levine's comparison of natural and archaeological assemblages. Similarly Klein *et al.* show the usefulness of comparing assemblages from sites which, on independent evidence, appear to have served different economic functions.